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SYSTEM SAFETY PROGRAM PLAN

EG&G Washington Analytical Services Center, Inc.
1400 San Mateo SE, Suite B
Albuquerque, New Mexico 87108

8 August 1980

Final Report for Period 31 March 1980—8 August 1980

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This document, System Safety Program Plan, is the implementing document covering the safety aspects of performing an EMP Test on the A7E aircraft in the HPD, VPD and NWEF at Kirtland AFB, New Mexico.

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PREFACE

This is the Safety Program Plan for the A-7E EMP Test Program activities to be performed at the Horizontally Polarized Dipole (HPD), the Vertically Polarized Dipole (VPD-II), and the NWEF aircraft hanger. All three facilities are located on Kirtland Air Force Base in Albuquerque, New Mexico.

This Safety Program Plan was reviewed on 3 July 1980 by the AFWL Technical Safety Committee which included representatives from the Kirtland AFB Safety Office and NWEF Safety Office. This committee recommended this Safety Program Plan be approved after inclusion of minor precedural changes (which have been included in this final version).

CONVERSION FACTORS FOR U.S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

To Convert From	To	Multiply By
angstrom	meters (m)	1.000 000 X E -10
atmosphere (normal)	kilo pascal (kPa)	1.013 25 X E +2
bar	kilo pascal (kPa)	1.000 000 X E +2
barn	meter^2 (m^2)	1.000 000 X E -28
British thermal unit (thermochemical)	joule (J)	1.054 350 X E +3
cal (thermochemical)/cm^2§	mega joule/m^2 (MJ/m^2)	4.184 000 X E -2
calorie (thermochemical)§	joule (J)	4.184 000
calorie (thermochemical)/g§	joule per kilogram (J/kg)*	4.184 000 X E +3
curie§	giga becquerel (GBq)+	3.700 000 X E +1
degree Celsius‡	degree kelvin (K)	$t_K = t°_C + 273.15$
degree (angle)	radian (rad)	1.745 329 X E -2
degree Fahrenheit	degree kelvin (K)	$t_K = (t°_F + 459.67)/1.8$
electron volt§	joule (J)	1.602 19 X E -19
erg§	joule (J)	1.000 000 X E -7
erg/second	watt (W)	1.000 000 X E -7
foot	meter (m)	3.048 000 X E -1
foot-pound-force	joule (J)	1.355 818
gallon (U.S. liquid)	meter^3 (m^3)	3.785 412 X E -3
inch	meter (m)	2.540 000 X E -2
jerk	joule (J)	1.000 000 X E +9
joule kilogram (J/kg) (radiation dose absorbed)§	gray (Gy)*	1.000 000
kilotons§	terajoules	4.183
kip (1000 lbf)	newton (N)	4.448 222 X E +3
kip/inch^2 (ksi)	kilo pascal (kPa)	6.894 757 X E +3
ktap	newton-second/m^2 (N-s/m^2)	1.000 000 X E +2
micron	meter (m)	1.000 000 X E -6
mil	meter (m)	2.540 000 X E -5
mile (international)	meter (m)	1.609 344 X E +3
ounce	kilogram (kg)	2.834 952 X E -2
pound-force (lbf avoirdupois)	newton (N)	4.448 222
pound-force inch	newton-meter (N·m)	1.129 848 X E -1
pound-force/inch	newton/meter (N/m)	1.751 268 X E +2
pound-force/foot^2	kilo pascal (kPa)	4.788 026 X E -2
pound-force/inch^2 (psi)	kilo pascal (kPa)	6.894 757
pound-mass (lbm avoirdupois)	kilogram (kg)	4.535 924 X E -1
pound-mass-foot^2 (moment of inertia)	kilogram-meter^2 (kg·m^2)	4.214 011 X E -2
pound-mass/foot^3	kilogram-meter^3 (kg/m^3)	1.601 846 X E +1
rad (radiation dose absorbed)§	gray (Gy)*	1.000 000 X E -2
roentgen§	coulomb/kilogram (C/kg)	2.579 760 X E -4
shake	second (s)	1.000 000 X E -8
slug	kilogram (kg)	1.459 390 X E +1
torr (mm Hg, 0° C)	kilo pascal (kPa)	1.333 22 X E -1

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SECTION 1

INTRODUCTION

Safety is the primary concern in any experimental effort. Test operations performed in a hazardous manner can result in loss of life, or injury to personnel. Inattention to safety can also result in damage to equipment and in subsequent inability to complete the required experimental tasks.

This document addresses the safety aspect of performing an Electromagnetic Pulse (EMP) test on an A-7E Aircraft in the HPD, VPD II, and NWEF hangar facilities at Kirtland Air Force Base (KAFB). The safety aspects of this test can be divided into two main categories. The first category embraces those elements of the safety problem which are common to the class of tests, facilities, environment, etc., which have been encountered previously. Safety measures and procedures exist for this class of hazard. The second category encompasses those hazards which are unique to this test effort, and therefore have not been encountered previously.

This document will not reanalyze those hazards which fall into the first category. They will be identified and the existing procedures and equipment employed to counteract those potential hazards will be cited.

In the area of safety problems and hazards which are unique to this test program, a hazard analysis in accordance with Reference 1 (discussed in detail in Section 5 of this document) will be performed and recommended solutions will be derived.

In the process of analyzing the test operations to identify hazards, and to determine solutions to control these hazards, it is necessary to distinguish between hazards which can be eliminated and inherent hazards. For hazards which can be eliminated, the necessary steps will be taken to rectify the hazardous conditions. In the case of inherent hazards, the corrective actions and/or procedures will be directed towards:

(a) Reducing the hazardous conditions as much as possible.

(b) Minimizing personnel exposure to the hazard.

(c) Insuring that the safety measures are adhered to at all times.

Figure 1 depicts the relationship of the Test Program Safety Plan with other A-7E documents. Safety requirements derived from the safety and hazards analyses will be inserted into the appropriate test procedures for implementation as shown in the figure.

Section 2 of this document is a background section to familiarize the reader with the A-7E Assessment Program, its objectives, the test facilities and the assumptions concerning the implementation of this test effort. The assumptions stated are those which are pertinent to the safety analysis.

Section 3 gives a brief description of the HPD and VPD II Test Facility.

Section 4 lists the sources used to establish the safety requirements.

Section 5 contains the safety and hazard analyses.

Section 6 presents the safety program for the A-7E Assessment Program in HPD and VPD II.

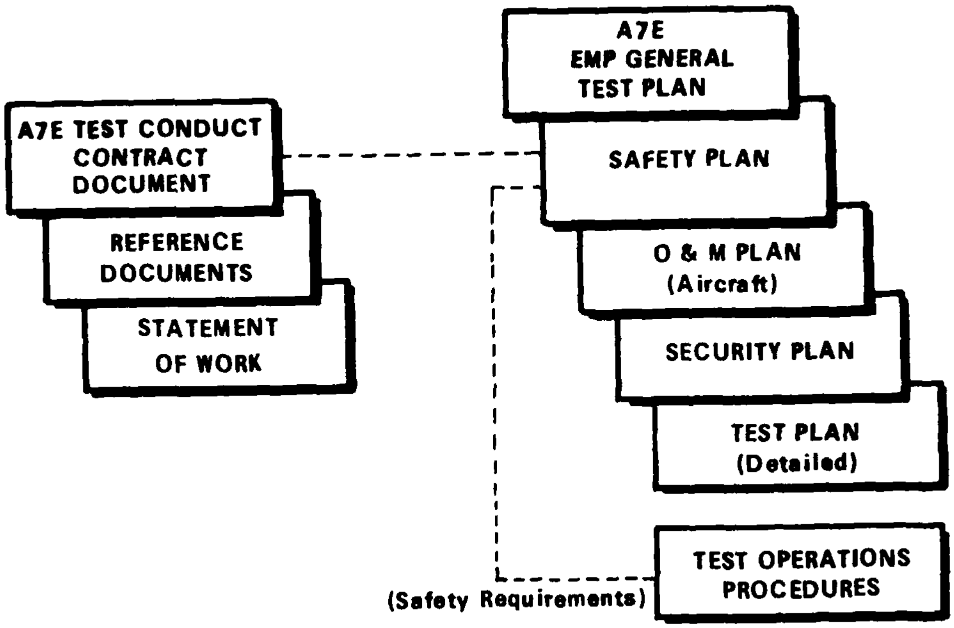


Figure 1. Test Program Safety Plan Relationships

SECTION 2
BACKGROUND

2-1 PROGRAM OVERVIEW

The A-7E EMP test is designed to be the primary source of empirical data and, as such, is an integral portion of the overall EMP assessment program for the A-7E system. The purpose of this test is to provide sufficient test data and evaluation for subsequent incorporation into the overall EMP program.

Test data used in the assessment to validate or supplement analytic data, or to calculate parameter values, will be obtained from approximately five months of testing on an A-7E at the HPD and VPD II test facilities. Testing will enhance the understanding of the aircraft EMP mechanisms, e.g., dominant Points of Entry (POE), major cable coupling paths, wire current distributions and variability. Detailed test planning will precede the tests to assure smooth and safe test operations, to assure that all data needed for the program is obtained, and to assure that test procedures lead to valid data. Hazards analysis by the Analysis contractor will identify all boxes that might be damaged during test.

Pre-test analysis will facilitate damage analysis, test planning and testing, and provide analysis inputs by calculating thresholds for damage screens.

2-2 TEST OBJECTIVES

We have established a set of test objectives which we feel will produce the quantity and quality of data required to support the overall program objectives. In general terms, the test objectives are:

(a) Obtain the quantity and quality of data needed to reproduce an accurate evaluation of the EMP susceptibility of the A-7E aircraft, and make hardening recommendations.

(b) Develop the technology and EMP test expertise to conduct the A-7E and subsequent Navy tactical aircraft system-level evaluations in the most effective and efficient manner possible.

2-3 APPROACH

The approach to this test program has been to structure a series of tests, each with a specific technical objective, to be performed using the A-7E as the test vehicle. The primary motivating force in the selection of tests and in the prioritization of these tests, is to evaluate the EMP effect on the A-7E aircraft. Having selected these tests, a series of test requirements has been derived. Based on the objectives and the requirements, a sequence for testing in the HPD evolved. This Safety Analysis concerns itself with executing the planned tests in a safe manner. It thus draws on the information derived from the objectives and requirements (orientations, configurations, etc.) to determine those activities which are hazardous, and to develop procedures, equipment, etc., which will eliminate or control test hazards.

2-4 ASSUMPTIONS

In order to develop an analysis for safety, identify hazards, and identify potential solutions to these hazards it is necessary to have a large amount of detailed information concerning the manner in which the test program is to be implemented. In this regard, there are basically two choices, delay performing a safety analysis until such time as all of the required information is available, or postulate, based on the best available information, those conditions, factors, etc., which have to be defined in order to perform the safety analysis. The second alternative provides a reasonably early examination of potential safety problems. The second alternative also necessitates reiteration through the test planning phase of the program in order to guarantee that all potential hazards have been identified and dealt with by the initiation of the test effort. The first approach relegates safety to a relatively unimportant consideration in the basic planning process until the entire program has been planned to a point where it is not easy to make major changes to equipment or program direction in order to achieve a safety test program. Clearly then, the second alternative,

although somewhat lacking initially, and requiring more total effort, provides a much more effective solution to the safety problem. This document, therefore, is the initial safety analysis. It is based on certain assumptions concerning the orientations and configurations of the vehicle. The purpose of this section is to state clearly these assumptions. Fundamental to this program is a continuing examination of the validity of the assumptions stated below.

2-4.1 Orientations/Configurations

The A-7E will be positioned in the facilities in several configurations and orientations during the test. In the HPD facility, it will be positioned on the ground simulating Ground Alert, both with the fuselage perpendicular and parallel to the pulser, with three separate weapon configurations. During this phase of testing, a wire mesh will be in position under the aircraft to simulate an aircraft carrier deck. Later in the test, the aircraft will be placed on the ten meter high wooden test stand built for the F-16 test to simulate the in-flight configuration. Figures 2a and 2b show the orientations with the fuselage parallel to the pulser. In the VPD-II facility, the aircraft will be placed on the ground with the tail of the aircraft perpendicular to the pulser as shown in figure 2c.

2-4.2 Access to A-7E

Access to the aircraft will be achieved by use of a workstand, and existing access ports.

2-4.3 A-7E Power Conditions

For the A-7E program, testing will be performed in both the power-on and power-off (simulated power-on) modes. For the power-on mode, the aircraft power supply will be a 10 kVA hydraulically driven motor-generator. It will supply electricity for the on-board electronic and electrical systems.

2-4.4 Instrumentation

An "artery concept" will be used during this test. Utilization of this concept entails instrumenting up to 8 sensors

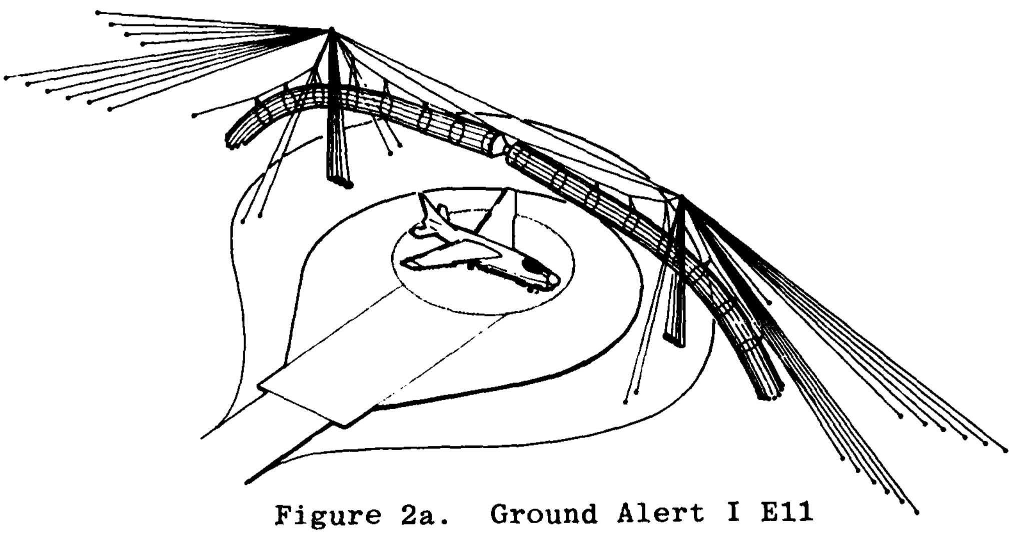


Figure 2a. Ground Alert I E11

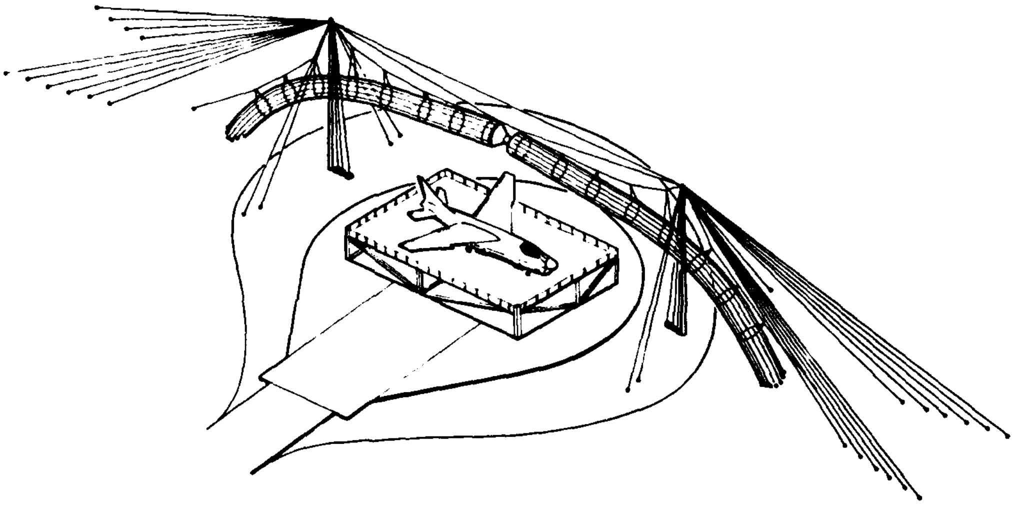


Figure 2b. Test Stand E11

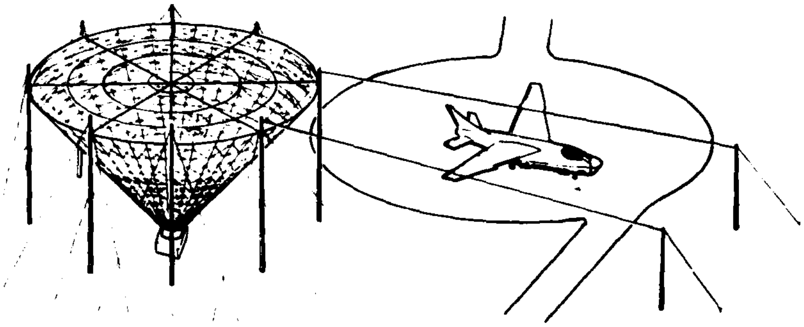


Figure 2c. Ground Alert II

desired for that part of the test day. The few chosen sensors are then routed into multiple fiber optic link (FOL) data channels which transmit the desired test information (environment induced transients) to a recording system (DASET).

2-5 SKIN CURRENT INJECTION TESTING

In an effort to improve the effectiveness and efficiency of the Navy EMP program, the Naval Surface Weapons Center is investigating skin current injection test (SCIT) techniques as an alternative method for EMP simulation. This testing, which will be conducted at the NWEF hangar during July 1980, is an adjunct to but not part of the A-7E system-level EMP test. Since this testing will be conducted by the same contractor, EG&G, that will conduct the test at the HPD/VPD-II facilities and several similar techniques will be used, this test program has also been included under the purview of this safety plan.

2-6 SAFETY PROGRAM OVERVIEW

Figure 3 represents an overview of the A-7E system-level EMP test safety program.

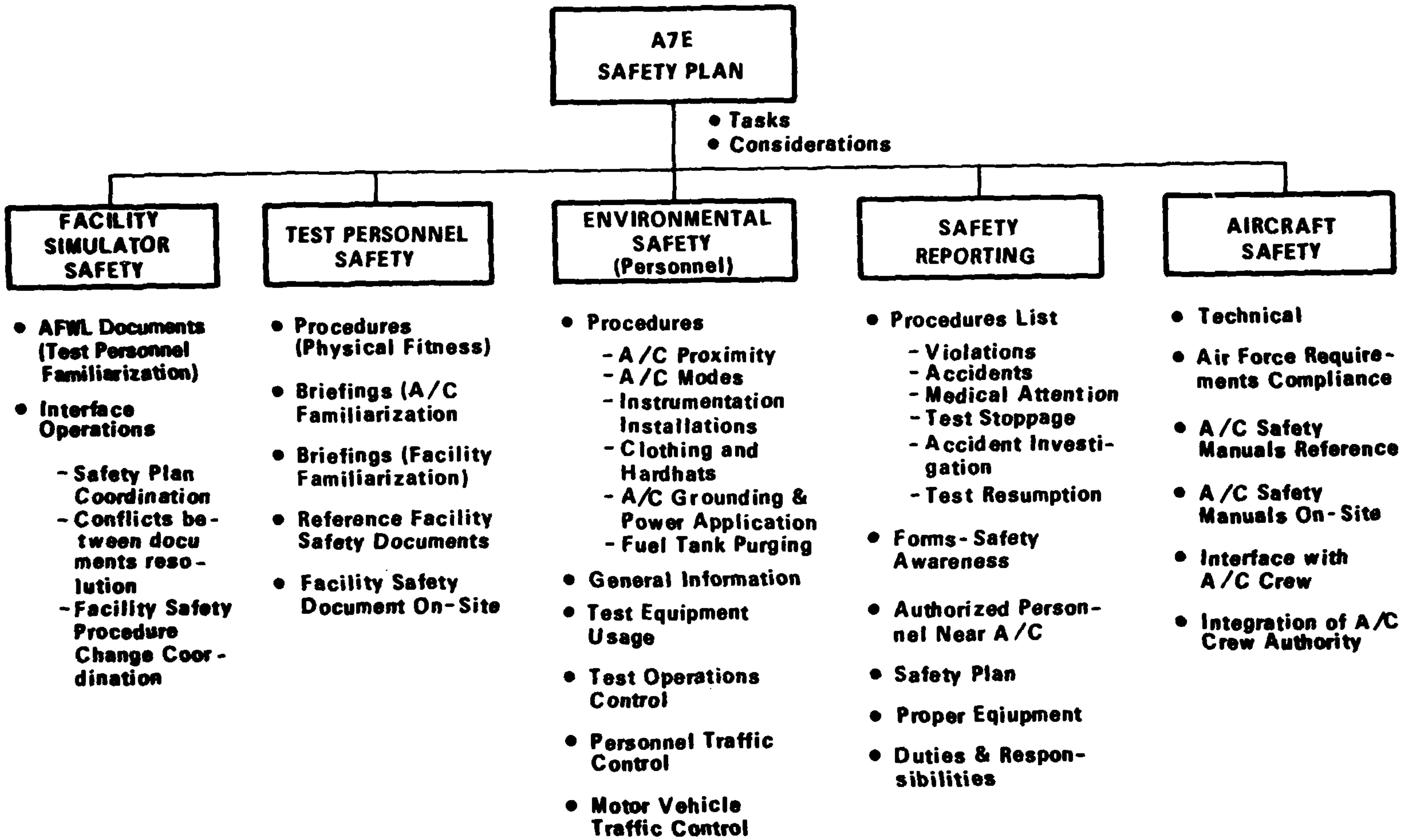


Figure 3. Safety Tasks/Considerations

SECTION 3
FACILITIES DESCRIPTION

3-1 HORIZONTALLY POLARIZED DIPOLE (HPD)

The HPD (Figure 4) facility is the newest horizontally polarized simulator at KAFB. The HAG-II pulser will be the radiation source for HPD. The HAG-I pulser is the backup for HAG-II.

The HAG-II produces fields of approximately 35 kV/m directly beneath the pulser which is suspended 30 meters (98.4 feet) above the parking pad. At 100 meters from the pulser, the field is approximately 8 kV/m.

The HPD antenna is shaped somewhat like a half ellipse with a major diameter of 150.7 meters and a minor radius of 30 meters. Though much larger, the HPD structure takes on the shape of SRF when it is up and in position.

The HPD site also has a portable recording station called DASET (Data Acquisition System for EMP Testing). FOL receivers, digitizers, timing equipment, and computer control are housed in a shielded compartment within a van. It is usually located 61 to 73 meters away from the test vehicle in a null area of the HPD antenna. For this test program, DASET will be configured for eight data channels simultaneously with two digitizers per channel available.

The facility also has a reference sensor station for monitoring and recording the radiated environment as a performance check on the pulser's operating parameters; i.e., risetime, level, and pulse shape.

3-2 VPD II FACILITY (VPD II)

The VPD II facility (Figure 5) consists basically of a five megavolt pulser, gas box, suspended radiating antenna, suspension system, ground plane, command, control and monitoring system, a test pad and other ancillary supporting systems.

The five megavolt pulser is located in an underground pulser room at the antenna/pulser apex. A 9.1 meter diameter gas box containing the pulser monocone extends from ground level directly over the pulser to a height of 5.4 meters. A solid

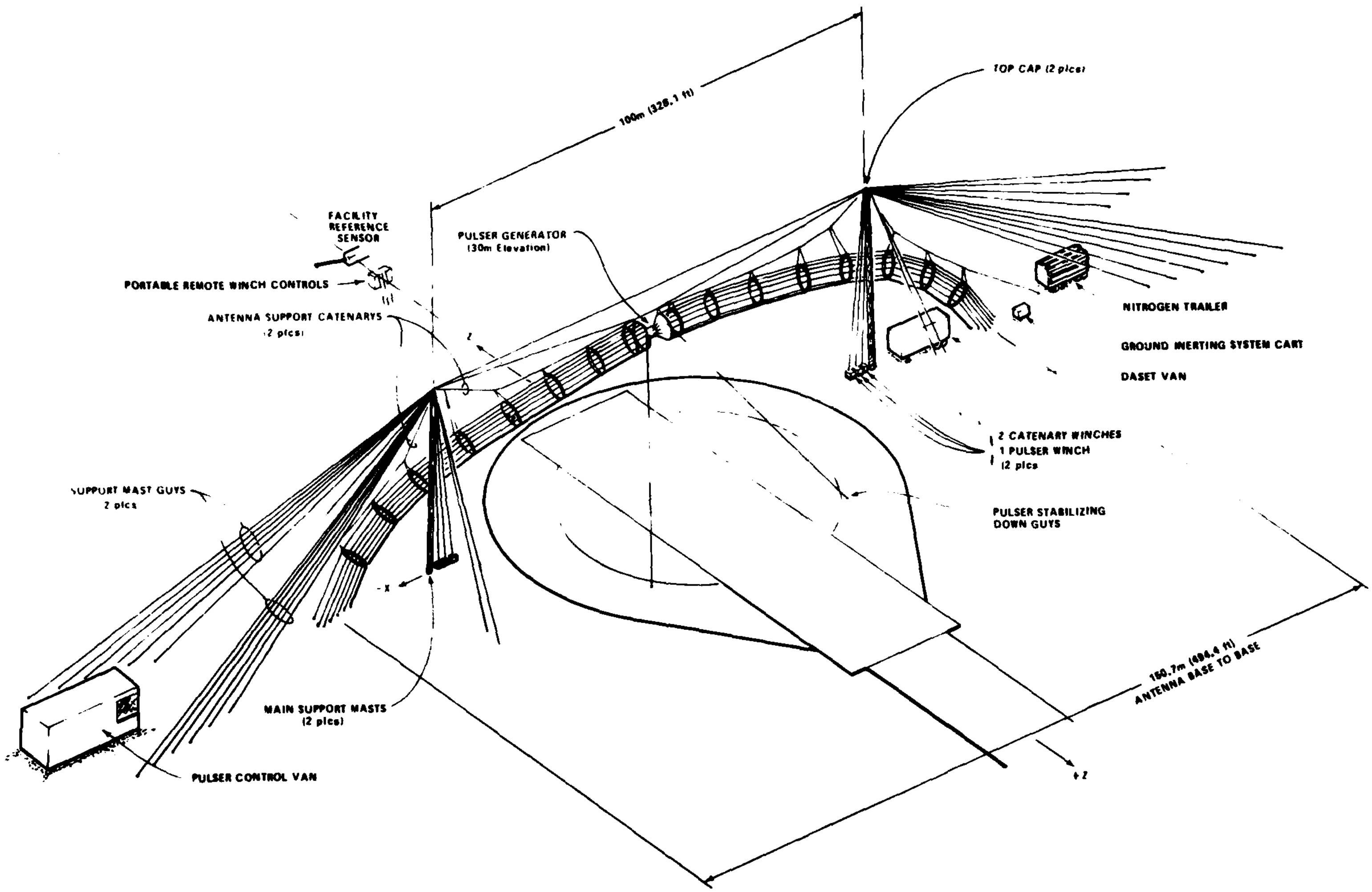


Figure 4. HPD Facility

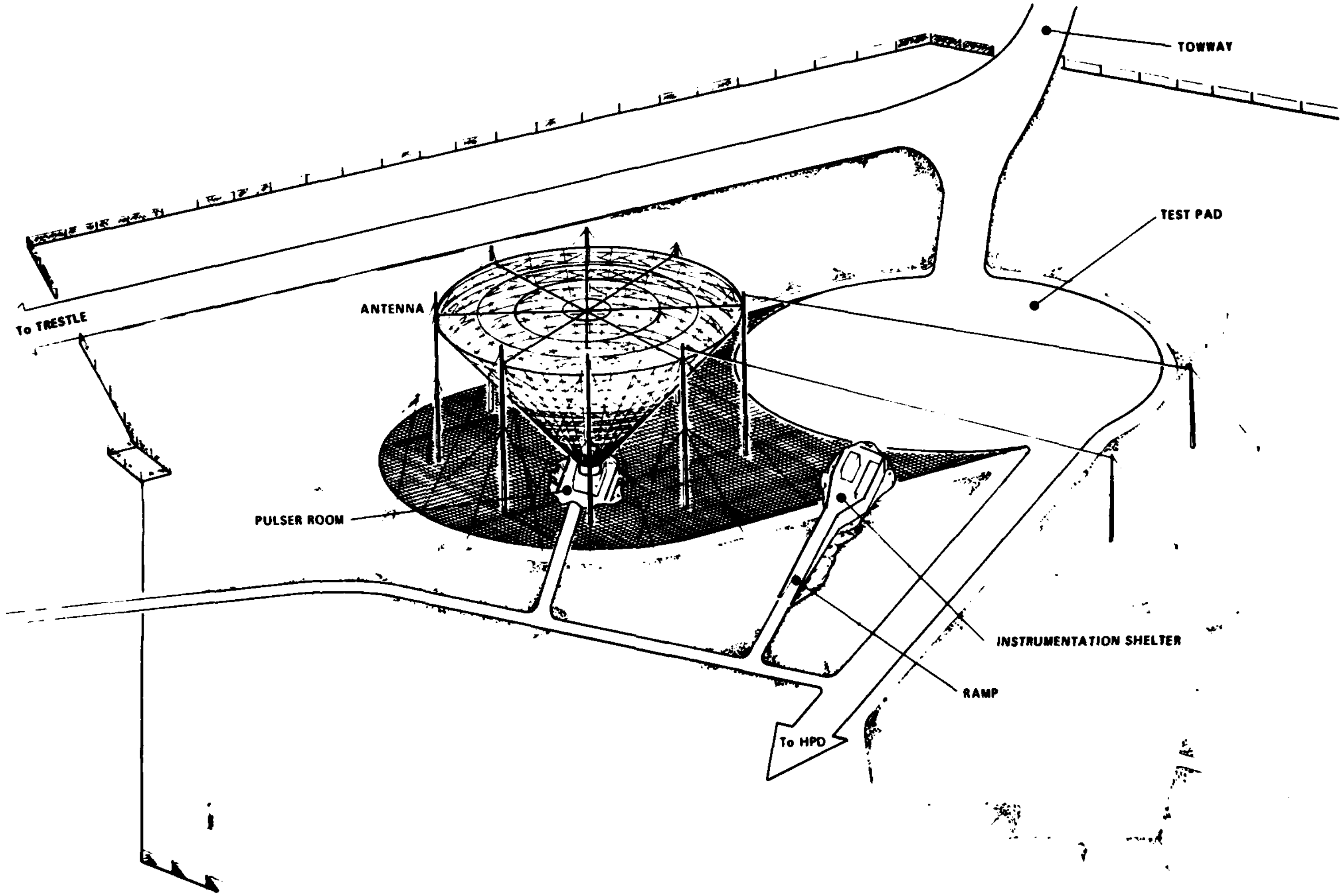


Figure 5. VPD II (Artist's Concept)

cone transition continues from the gas box/monocone for approximately 0.6 meters to the antenna interface at which point the antenna is attached (6.0 meter height).

An underground reinforced concrete trailer shelter is located near the test pad under the ground plane. The shelter is large enough (11m x 14.6m x 4.2m high) to house the VPD II Command and Control Van and a user instrumentation van. A roll-up door (7.3m x 3.9m high) provides protection from the outside climatic conditions. Access to the shelter is provided by a 5.5 meter wide ramp extending to the ground surface. The trailer shelter provides electrical power, lighting, ventilation, water and fire protection and warning systems for the user. The trailer shelter is connected to the pulser building and test pad centerline via underground electrical conduits for routing cables to command the pulser and to receive test data from the pad. It is also connected to several reference sensors located on the facility centerline midway between the apex and test pad. The trailer shelter provides no heating or air conditioning as these systems are contained within the command and control and test instrumentation vans.

Four EM reference sensors are mounted on the facility ground plane; two each on the facility centerline 50 meters from the apex and two each within the pulser gas box. These sensors monitor the EM environment during test operations. Sensor signals are transmitted to the recording equipment within the Command and Control Van via coaxial cables routed through the welded metallic conduits beneath the ground plane.

The test pad is a 50 meter radius, concrete slab located 100 meters from the simulator apex. The slab is 30 cm thick and is covered by the ground plane and the 7.6 cm thick asphalt overlay. The test instrumentation cable port is located at the test pad center point from which the underground, welded steel conduit is routed to the instrumentation trailer shelter. Tie downs and static ground points are incorporated into the test pad.

SECTION 4
SAFETY REQUIREMENTS

This section of the Safety Analysis Document summarizes the sources of criteria, considerations and requirements relating to safety. There are primarily three controlling documents relating to safety which have been examined in considerable detail in the formulation of this safety program. They are:

1. Air Force Weapons Laboratory Regulation 127-1, Safety (Reference 1).
2. Air Force Regulation 127-101, (Reference 3).
3. OSHA, Occupational Safety and Health Standards (Reference 4).

Each document is discussed briefly below.

4-1 AIR FORCE WEAPONS LABORATORY REGULATION 127-1

This regulation has been prepared by the Air Force Weapons Laboratory to implement a safety review procedure which is required by Air Force Systems Command Regulation 127-4. It is primarily concerned with the establishment of a Safety Program within the Air Force Weapons Laboratory. This document further presents an outline of the manner in which preliminary hazard analyses are to be performed. Hazardous elements are defined, events causing a hazardous condition are examined, events causing potential accidents are reviewed, and the effects are determined. Accident prevention measures designed either to eliminate the hazard or to minimize the potential danger are then determined.

The safety analysis which is contained in Section 5 of this document is essentially in five parts. The first part addresses the analysis of hazards associated with the aircraft arrival and departure. The second part discusses potential hazards during ground transportation of the aircraft at the HPD, including entrance into the facility. Aircraft maintenance operations are included in the third part. A-7E EMP test preparations are next. The fifth part addresses the hazards to be encountered in the HPD when test operations are in progress.

4-2 AIR FORCE REGULATION 127-101

The purpose of this manual is to provide guidance for Air Force wide industrial safety accident prevention programs. It explains the hazards in and prescribes safety precautions for operating industrial types of equipment. It is designed to augment other Air Force publications. It covers such subjects as the fundamentals of accident prevention, safety practices in construction and maintenance, health hazards and protection, fire protection, and safety in materials handling. This is a detailed general safety document which addresses the majority of safety considerations encountered in day-to-day contractor operations. Potentially hazardous operations encountered in the A-7E test which are covered by this document will not be analyzed any further in great detail. The recommended safety procedures, equipment, etc., designed in AFR 127-101 will be adopted for this program.

4-3 OSHA

This document (Reference 4) is a very broad and detailed delineation of safety standards for industry in general. It covers a very wide variety of occupations and working conditions. Sections of this document which relate to construction and testing of work platforms are those most relevant to the safety analysis for the A-7E testing.

4-4 COMPARISON, OSHA, AFR 127-101, AND AFR 127-12 STANDARDS (REPLACING AFR 127-101)

A review of OSHA, Chapter XVII, Occupational Safety and Health Administration, Department of Labor, Section 1910, contained in the Federal Register dated 18 October 1973, has been conducted in order that a comparison can be made with the Industrial Safety Accident Prevention Handbook, AFR 127-101, dated 26 June 1970, Department of the Air Force. The purpose of this review was to ascertain any conflicts between the two documents. No conflicts were found. In some cases, OSHA is much more detailed, but the same rules and regulations can be found in AFR 127-101. The Air Force is phasing in a replacement for AFR 127-101 designated AFR 127-12 (Reference 5). For completeness

this document is included in the comparison. The major areas of concern in support of this test program are shown in Table 1, with the corresponding OSHA and AFR paragraph and page numbers cross referenced.

4-5 ADDITIONAL REQUIREMENTS

Although the previously discussed documents go into great depth and cover a very wide spectrum of safety conditions, procedures and equipment, the basic rule of safety, "common sense", has not been ignored in the preparation of this document. The safest procedures result from education of test personnel of the hazards that could be encountered and consistent exercise of good common sense. Thus, as the analysis of the site operations for testing proceeds safety hazards, or potential safety hazards will be identified and dealt with, even those which do not fall directly within the scope of one of the above mentioned reference documents. The intent of this document is not to provide an analysis which relates strictly to the written requirements documented in Paragraph 4-1 through 4-4 above, but is to examine all aspects relating to a safe operating environment with the A-7E in the HPD facility, and to address all potential problems which are uncovered. The goal is not a document which only demonstrates a compliance to requirements, but also a safety test program.

4-6 HPD FACILITY SAFETY ANALYSIS AND HAZARDS (Reference 2)

The Dynalectron Corporation (and EG&G as a subcontractor) as the O&M Contractor of the simulators for the AFWL, has prepared a hazards analysis document. A-7E test personnel will be familiar with the contents of this document.

4-7 VPD II FACILITY SAFETY ANALYSIS AND HAZARDS (Reference 6)

EG&G WASC prepared a Facility Safety and Hazards Analysis document. All A-7E test personnel should be familiar with the contents of this document.

TABLE 1

CORRESPONDING OSHA AND AFR PARAGRAPHS

Document					Title
OSHA*		AFR 127-101**		AFOSH** Standards	
Paragraph	Page	Para.	Page	Number	
1910.22	22108	4-3	4-7	127-1	Walking-Working Surfaces
-	-	4-14	4-34	*** Section E & Atch. 2	Contractor Operations
1910.25	22110	4-10	4-25	127-4	Ladders, Wood
1910.26	22117	4-10	4-26	127-5	Ladders, Metal
1910.28	22121	4-10	4-16	127-7	Scaffolding
1910.67 1926.556+	22136	-	-	127-9 Manually Propelled	Vehicle Mounted Elevating and Rotating Work Platform
1910.97	22162	10-27	10-11	161-9	Electromagnetic Radiation
1910.106	22169	7-2	7-3	-	Flammable and Combustible Liquids
1910.109	22193	-	-	-	Explosives, AFR 127-100
1910.132	22231	5-13	5-17	-	Personnel Protective Equipment
1910.144	22238	4-11	4-27	-	Safety Color Code for Marking Physical Hazards
1910.145	22239	4-111	4-31	-	Accident Prevention Signs
1910.151	22242	-	-	-	Medical Services and First Aid
1910.156	22242	Chapt. 6	6-1	-	Fire Protection
1910.169	22253	4-9	4-24	-	Air Compressors
1910.176 through 1910.180	22253	Chapt. 11	11-1	-	Materials Handling
1910.241 through 1910.244	22294	Chapt. 3	3-50	-	Hand and Portable Power Tools
-	-	2-16 Sec. D	2.4	*** Section C	Education and Training

*Title 29 - Labor Chapter XVII - Occupational Safety and Health Administration, Department of Labor, Part 1910 - Occupational Safety and Health Standards, Federal Register, Volume 37, No. 202, October 18, 1972.

**Industrial Safety Accident Prevention Handbook, Department of the Air Force, 26 June 1970.

***AFR 127-12, Air Force Occupational Safety and Health Program, 4 June 1976.

+Safety and Health Regulations for Construction.

SECTION 5
HAZARD ANALYSIS

This section of the Safety Document for the A-7E tests in the HPD and VPD II facilities presents the Hazard Analysis for the test operations. The Hazard Analysis has been performed in accordance with Attachment 3 of AFWLR-127-1 (Reference 1). This section presents the test operations sequence, the hazard analysis that has been performed, and summarizes the main safety procedures to be applied which are derived from this analysis.

5-1 EMP TEST OPERATIONS

The test aircraft will be maintained in a near operational configuration by NWEF personnel during pre-test and hangar tests and Vought technicians during HPD/VPD II testing. To demonstrate that the aircraft equipment remains operational throughout the course of the EMP testing, periodic end-to-end functional checks will be performed by Vought technicians.

In order to organize the Hazards Analysis, the test operations have been examined and the major functions of the program operating sequence have been identified. These functions are:

- A-7E Arrival and Test Modification
- SCIT Hangar Tests
- Test Stand Mount and Mobility
- A-7E Test Preparation and Daily Maintenance
- A-7E EMP Testing
- Demodification and Departure

5-1.1 A-7E Arrival and Test Modification

Upon arrival, the aircraft will be hangared and prepared for modification to the approved basic airframe and systems test configuration as outlined in the General Test Plan. This will include fuel tank defuel, purge and inerting system preparation; installation of a hydraulic driven 10 kVA generator and controller; replacement of an "active" crew seat with an "inactive" seat and removal of some selected crew escape system pyrotechnics; installation of instrumentation peculiar harnesses, panels and

bracketry; aircraft engine preservation; checkout of weapon pylons and racks on two wing stations; conduct minor wiring and hydraulic changes to round out the test configuration.

5-1.2 SCIT Testing at the NWEF Hangar

There are only two hazards present during the SCIT test. These are the Delta System pulser and the compressed gases (air and nitrogen).

5-1.2.1 Delta System Any high voltage pulser, such as the Delta System, presents a number of hazards that are potentially lethal. These range all the way from the readily apparent, such as direct contact with the high tension electrical connections of the pulser system, to other very subtle but nevertheless lethal hazards such as the abrupt failure of an insulator which can suddenly and without warning present high electric potentials at points where they are not expected. In addition, a high voltage pulser system is similar to any advanced piece of equipment, such as an aircraft, in that if it is operated incorrectly, it can present a lethal hazard to life and limb.

Unlike many items of electrical equipment, a high voltage pulser system offers an added dimension of danger in that shock hazards are not always obvious. A lethal electric shock can be received from a capacitive high voltage system such as Delta even after the power supply has been turned off and disconnected, even after it has been shorted to ground and even after some period of time has elapsed since it was last used. This is especially true when there have been unnoticed failures in the system. It is therefore important to always be especially cautious if the system appears to be acting in an unusual or incorrect fashion.

The design of the Delta System has been made as safe as possible and still maintain the specified output. Nevertheless, the system must be handled prudently and with good practice. This is a portable system intended for use in the field and in relatively confined spaces and those circumstances can present hazards in addition to those normally associated with

EMP equipment. Because the system is portable, there is a possibility that the system will not be grounded properly when it is temporarily installed at various test sites. Test-induced failures in primary power lines or communications equipment can have dangerous results. When the Delta System is used in conjunction with primary power lines, the primary power lines present a source of energy which when released through a path created by a high voltage arc can blow apart the small grounding straps which are often used in laboratory environments. Such an accident could present a lethal hazard to personnel who are not expecting it before line circuit breakers have an opportunity to clear the fault.

All of these examples are mentioned simply to illustrate the fact that special care is required. The Delta System is a powerful and precise analytical tool. Misuse, however, can do lethal harm to personnel and damage to equipment. A list of rules to be followed in operating the system safely are:

(a) Always have all pulser operations conducted under the direct personal supervision of one individual who is responsible for all safety. The chief EG&G engineer will fill this role for SCIT testing in the NWEF hangar.

(b) Operate the system only with personnel experienced with EMP testing and high voltage systems and trained in the use of the Delta System. All NSWC and EG&G personnel involved in the SCIT test have extensive experience in both EMP testing and application of the Delta System.

(c) Before the beginning of each day or period of test firing, inspect the pulser and all the related equipment and the system under test to make sure that they are in good order. Particular attention should be paid to grounds and power supply connections. The EG&G chief engineer will accomplish this.

(d) Before each day's firing and each period of resumed f.ring, inspect all cable connections to make sure they are in good order and connected properly to their various modules. Remove all connection cables from the test area which are not being used and coil them neatly out of the way. A special hazard is that a cable will be inadvertently connected to a high voltage source at one end and the raw open end will not be connected at another. Make sure that all cables are connected into one of the correct modules at both ends. Be doubly certain that grounds are in place and firmly attached so that they will not fall off accidentally or be blown off in the event of a high energy short. A fail safe grounding rod will be installed to preclude accidental exposure to high voltage hazards.

(e) The two power supply and control modules should have a mechanically strong low inductance ground which connects directly to an earth ground in the vicinity of the operating personnel. During test operations of the system, personnel should only be in the vicinity of the two operating modules. Personnel should not be standing on cables, leaning on modules or standing in the vicinity of equipment under test.

(f) All covers should be on every module in use during normal operation. The only exception to this would be during testing and troubleshooting, the operations of the module in which exceptional care must be taken of personnel safety.

(g) The pulser module operates from a primary power source of 110 volts a.c. and this presents its usual hazards. This power is obtained through a 3-wire grounded connector and special attention should be given to the point that the third wire is in fact grounded at the receptacle and that the receptacle is in fact grounded.

(h) The Delta modules are designed to drive primary power lines with hard wire connections. It must be remembered that when the Delta System is being used to drive primary power lines directly that 60 cycle power voltages will be present not only in the normal primary power circuits, but also in the high voltage circuits of the modules. As a result, whenever the system is being worked on or opened up, not only should the primary power be disconnected but the pulser modules should be disconnected from their loads.

(i) No one should approach close to the high tension leads or change high voltage cables between shots except when the shorting bar is visibly determined by the operator to be down in the shorted position at the main control panel. Even when the pulser's high tension points are approached with the shorting bar down, high tension points should not be touched or approached without first being discharged by a separate grounding stick. The entire area used for testing will be secured using ropes and stanchions, and hazardous conditions will be made known to all personnel in the hangar area using a flashing light and loudspeaker announcements.

5-1.2.2 Compressed Gases Since all compressed gases to be used (air and nitrogen) are non-explosive and non-flammable, only normal precautions to prevent mechanical damage to the containers need to be observed. All cylinders will be stored and used in accordance with standard safety precautions.

5-1.3 A-7E Test Stand Mount and Mobility

Following SCIT testing and aircraft modification, the A-7E will be towed by NWEF personnel from the KAFB hanger to the Horizontal Polarization Dipole (HPD) site for ground alert testing followed by erection upon a specifically designed and structurally sound mobile test stand (7.9mH x 12.2mW x 15.8mL). Weapon shapes will be uploaded to the designated wing stations and the airplane/weapon electrical interface checked out. An offsetting pylon/ballast will be attached to the opposing wing stations. Peripheral test site support preparations will be in progress at this time assuring operation of ground support equipment, fiber optics data transmission, HPD power-up conditions and establishing logistics and personnel operations facilities.

A proofload certified aircraft hoist sling will be attached to the aircraft by Vought personnel in preparation for hoisting the airplane approximately (10.7 meters) above ground line. Structurally sound wooden support pylons will have been affixed to the nose jack point and wing station weapon hardpoints. With the landing gear extended, weight and balance and structural criteria will have been developed to ensure correct lifting attitude and structural integrity. A structurally sound and adequate crane/boom and proofload certified hook/cable/winch operated by subcontractor qualified operator/riggers under direction of the aircraft contractor will hoist the 27,000 lb. aircraft/weapon/ballast combination. Mobility and structural integrity of the 80,000 lb. test stand have been previously demonstrated. The stand will be moved under the raised airplane and the airplane will be lowered to its proper position over the stand and the aircraft/pylons will be secured to the airplane and subsequently to the test stand deck. Of primary

consideration will be the safe mobility of the test stand with the A-7E mounted to its deck (7.9 meters) above the ground.

Potential hazards are those associated with the daily programmed and emergency movements of the A-7E/stand into and out of test position under the HPD array. The stand will be configured with fixed and castered bogies (wheels) at rear corners and a "fifth wheel" attach arrangement for towing with the tractor portion of the tractor trailer by a qualified operator.

To minimize the potential hazards, a select number of contractor(s) personnel will be schooled specifically for the A-7E hoisting, tie-down and test stand relocation operations. The maximum tow speed of the test stand/airplane will be no more than (0.62 kilometer). Sudden accelerations or stops will not be permitted to minimize inertial upset of the A-7E. Timely forecasts of wind velocities above that of safe HPD operation will dictate A-7E/test stand emergency movement from under the HPD. The bogies will be locked and chocked when at rest. All hydraulic, air conditioning and electrical disconnections will be accomplished before test stand/airplane movement.

5-1.4 A-7E Test Preparation and Daily Maintenance

Daily airframe and system maintenance, including that of on-board instrumentation reconfigurations to point of DASET interface will be accomplished by a supervised Vought/EG&G work force. A typical work day is depicted in Figure 6. As in any test program, deviations to this will come about and have to be accommodated.

The test configured airframe and systems will require continuous preventative maintenance, repair/replacements and test configuration changes during the two shift work day. The intent is to assure that all A-7E systems continue to operate satisfactorily to provide for a viable EMP test.

After the aircraft has been erected and secured to the test stand and the hoist sling and ballast removed and topside panels closed, the aircraft is ready for test preparations/release. Externally provisioned ground power, cooling air and

TIME	ACTIVITY	ORGANIZATION RESPONSIBILITIES		
		O&M(DYNE/TRW)	USER(DNA/TRW/EG&G/NWEF)	VOUGHT/NSWC
6:30	Morning Prep	•HPD-Raise/Turn-On -Warmup/Checkout •DASET/ADSET Ready •QC Instrumentation	•Review Data •QC Instrumentation •F/O-Setup-C/o •A/C Position	
7:00	BRIEFING	ATTEND	BRIEF	ATTEND
8:30	Testing	•Operate-DASET -ADSET -PULSER	•Direct Test •Qualify Data •Perform and Q.C. Instrumentation Changes	
10:00	Noise			
10:30	Reinstrument			
11:40	Lunch 1 (40 Min.)			
12:00	Shift 2 Begins			
12:20	Lunch 2 (40 Min.)			
12:30	Noise			
1:00	Reinstrument		•Analyze Data •Evaluate P.M. Plan	
3:00	Noise	•Operate-DASET -ADSET -PULSER	•Direct Test •Qualify Data	
3:10	Shift 1 Ends		•Perform and Q.C. Instrumentation Changes	
3:30	Reinstrument			
5:30	Noise			
6:00	Prepare 30 Additional Test Points for Next Day Testing	•HPD-Lower/Secure •DASET/ADSET Shutdown •Equipment Maintenance As Needed	•Review Data •Plan for Next Day •Perform and Q.C. Instrumentaion Changes	•A/C - Maintain As Required

Figure 6. A-7E Daily Test Operation

fuel tank inerting facilities will be connected and checked out to ensure airframe/systems compatibility and adequacy. Tech Orders, AEIs, engineering drawings and specifically prepared procedures will be used for these and the daily servicing operations to follow for the next several months.

While on the test stand and under EMP test conditions, the airplane and systems electrical power will be provided by the test installed 10 kVA hydraulically driven generator and controller. Hydraulics for this will be provided from a remote hydraulic test stand through non-conductive high pressure lines. This generator is Air Force approved and provisioned equipment.

Airframe and systems cooling air will be provided from one or possibly two remote air conditioning carts via non-conductive duct work.

Continuous fuel tank inerting with low pressure gaseous nitrogen will be provided from a remote source via non-conductive line.

Potential hazards associated with these servicing actions will be minimized by following established A-7E servicing procedures as well as those developed specifically for the peculiar test configuration and operations. These peculiar procedures will comprise part of the Class II, Part II modification documentation.

Daily airframe, systems and instrumentation test preparations and operations while on the test stand will require access to practically all areas of the aircraft. Personnel access to the avionic bays, engine compartment and many other pre-postflight maintenance/inspection areas are at ground (deck) working level, negating the need for a number of workstands. Access to the cockpit will be via specially constructed wooden stands which will remain on the test stand deck. Access to topside of the aircraft should be minimal and can also be effected with one of the wooden stands. Access panels are either structural and installed with retained quick-removal fasteners or non-structural which are hinged and thumb latched for ready access.

Access will be required many times daily to implement instrumentation changes such as installing breakout connectors or for system/component troubleshooting, removal/replacement. Some aircraft configuration changes may be required during the tests, such as sealing selected points of entry (POEs), sealing off deliberate antennas and raising and lowering the landing gear and canopy.

The inputs for test preparation configurations will be given by the Test Director to the designated test support personnel at controlled pre-test briefings. These requirements will be documented via airframe/system QARs and instrumentation FCRs. This paper will constitute authority for configuration changes, maintenance, repair and replacements and become part of the official airplane paper. All airplane/system activities will be directed by qualified design/test engineering and maintenance supervision. Instrumentation activities will be directed by qualified instrumentation engineers. This airplane Release-For-Test will consist of a consolidation of these activities and stamped off by maintenance/instrumentation supervision and finally certified by Flight (Test) Release Quality Control personnel.

Following the daily EMP test activity, the stand/aircraft may be moved out from under the HPD array and prepared for aircraft/systems preventative maintenance, diagnostic trouble-shooting, removals/replacements, instrumentation reconfigurations and pre-release for the next days operations (second shift).

The aircraft will be properly grounded using approved static grounding procedures at all times other than when under-going EMP testing. Communications will always be maintained between the airplane on the test stand deck and the ground support personnel. Hard hats and other applicable safety equipment will be worn, as required in the area of the test stand. Loose equipment will be secured. Adequate portable lighting will be used. Only approved tools, test equipments and maintenance procedures will be used. Peculiar test base instructions (TBIs) will be developed on site to comply with local operations requirements.

5-1.5 A-7E EMP Testing

A test day will begin with a Test Director's morning briefing, consisting of an airplane/systems/instrumentation status review, followed by an engineering test plan briefing with the HPD contractor and subcontractor test conduct personnel.

Assuming the HPD array and airplane are ready - a formal pre-test release will proceed assuring proper instrumentation sensor installations, all points of entry are identified and sealed, as required, and panels installed. The test stand will be prepared and moved under the HPD array after clearance has been given to do so. The airplane/systems supportive power, air conditioning and fuel tank inerting will be connected and powered-up, as will the instrumentation fiber optic trunkline to DASET interface. The test stand/airplane, HPD pad area will be cleared of all extraneous personnel and equipments in preparation for Electromagnetic Pulsing.

Following each HPD pulsing, the Test Director will communicate instructions regarding test support activity desired for the following post/pretest. Access to the airplane cockpit and equipment bays will be frequent to survey the cockpit panels, scopes, gauges, and reconfigure the instrumentation, as well as conduct routine servicing. This activity will be accomplished by qualified technicians/mechanics.

Hazards associated with the test, post/pretest activities are most likely to occur within the HPD EMP environment and around the elevated airplane. The electromagnetic environment generated by test facility can vary, dependent upon aircraft location, from a few hundred volts per meter up to levels of approximately one-hundred-thousand volts per meter peak electric field intensity. There are two main elements involved in the exposure of the aircraft to the environment.

(a) Charging the pulser.

(b) Radiation into the facility, i.e., aircraft exposure.

The main hazard associated with this operation is related to the possibility of having personnel in the immediate proximity of some large metallic object, such as the aircraft. The resultant potential hazard is arcing from the metal through the individual to the ground. In previous extensive test efforts in both HPD and VPD EMP simulators, procedures have been established which insure that all personnel are clear of the environment volume during the exposure of the aircraft. The basic approach involves clearing the area prior to the time the pulser is charged, monitoring the area throughout the charging period and the exposure time to assure that no personnel inadvertently enter the exposure volume during the testing. A highly conspicuous flashing light and loudspeaker announcement are used to alert personnel when dangerous conditions exist in the test pad. This procedure continues to apply at the HPD.

Another event causing a hazardous condition is the raising and lowering of the HPD pulser/antenna system. This operation will be coordinated between the A-7E Test Director and the Facility/Pulser C&C operator to prevent any unsafe conditions from occurring. A briefing to the test personnel regarding the test hazards will minimize accidents.

5-1.6 A-7E Demodification and Departure

Upon completion of the HPD EMP test activities, the aircraft will be removed from the test stand. The weapons will be removed. The airplane will be towed to KAFB to be hangared for demodification and preparations made for fly-away.

Demodification at KAFB will involve removal, disconnect of all non-flight worthy equipments and access panels. The pyrotechnics and active crew seat will be installed and checked out. The engine will be depreserved, JP-4 will be cycled through the fuel tanks. A ground engine run will be accomplished.

5-1.7 Summary

In examining the set of test related operations, and the safety aspects of each, one can observe a repetitive pattern.

Basically, there are four safety elements to be considered in the test program:

1. The weight and bulk of large objects which must be moved, such as the aircraft and test stand/aircraft.
2. The operations on the aircraft which involve electrical power connections and personnel working at heights above ground level.
3. The safety aspects related to the EMP environment itself.
4. The maintenance of aircraft flight worthiness, including the prevention of damage to the A-7E systems.

The recommended safety program which is described in the next section and locally prepared procedures will be structured about these main areas.

Figures 7 through 29 contain sketches which depict airplane configurations and maintenance/test operations.

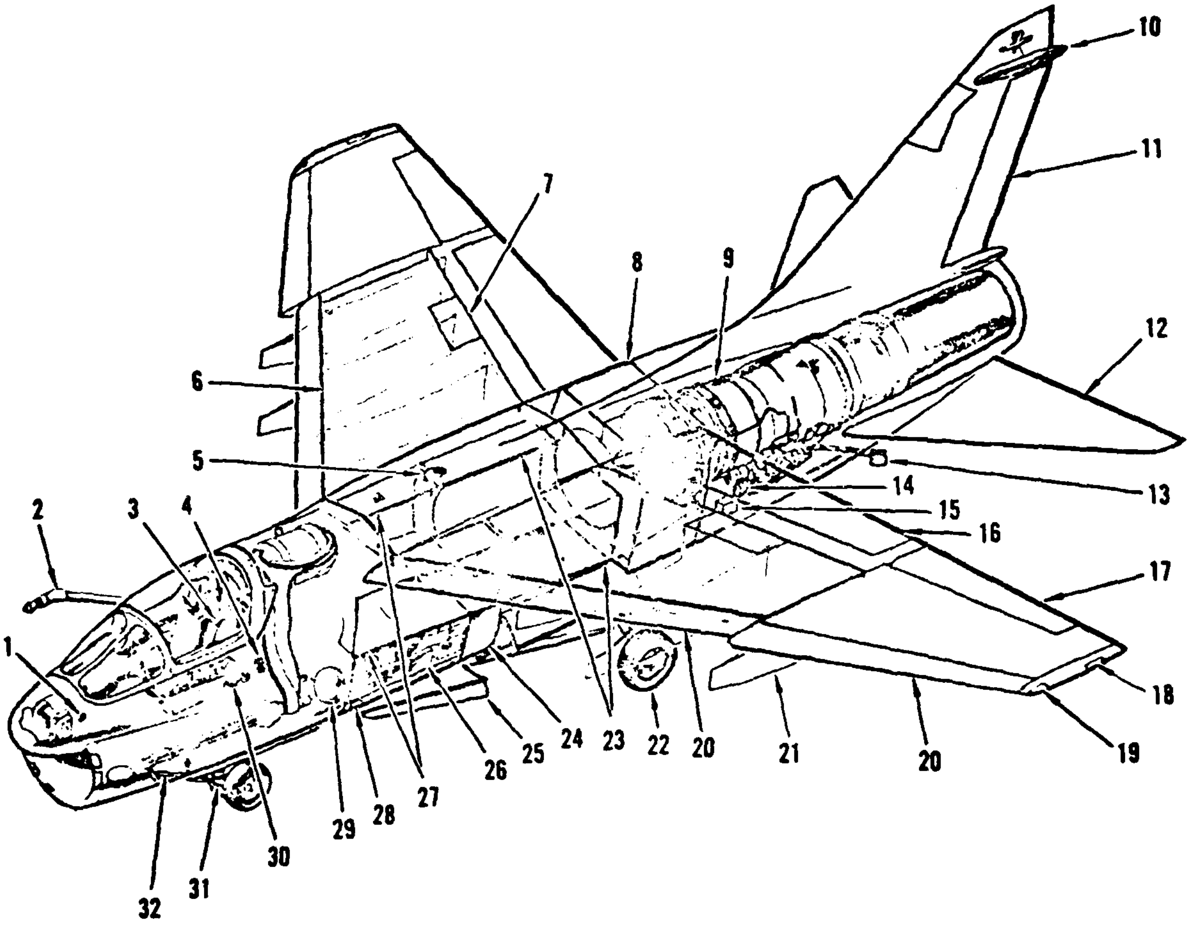
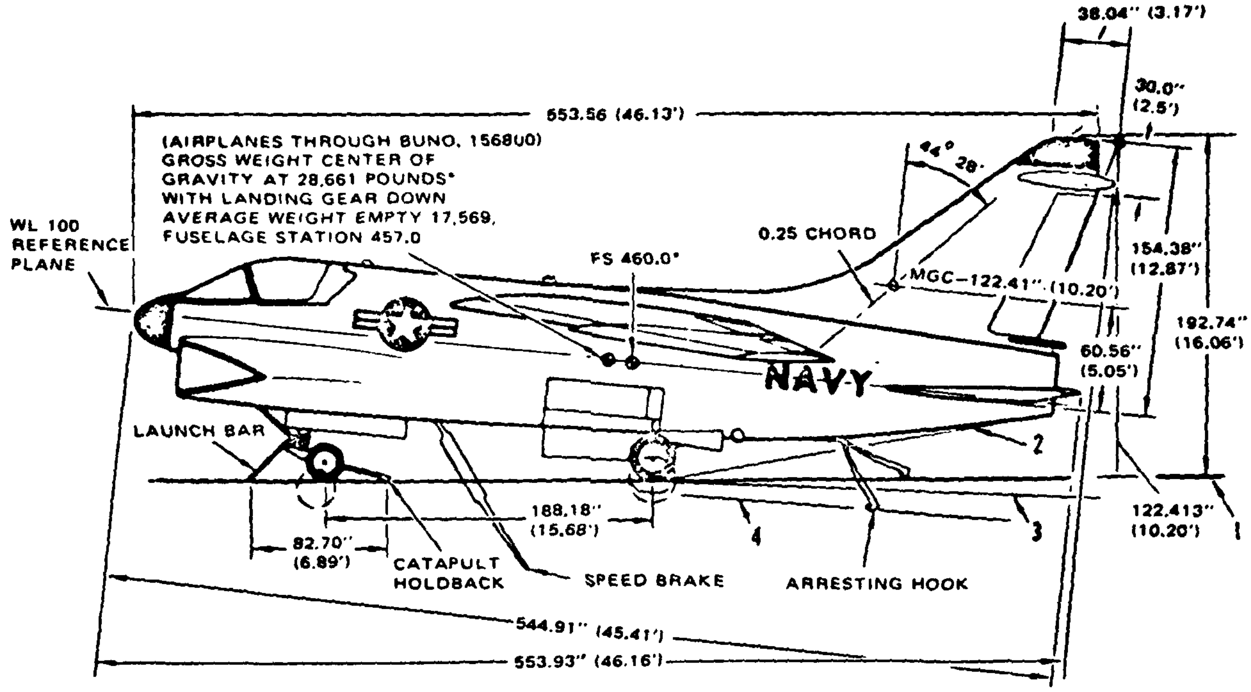


Figure 7. Airplane General Arrangement



NOTE

1 Static three-point ground line – 5°40'.

2 Maximum tail down ground line – 14°30', main gear and tires statically deflected.

3 Ground line – Main gear and tires statically deflected, nose gear fully compressed and tires flat.

4 Ground line – 108', main gear extended 50% from static position, tires static and nose gear fully compressed, nose tire flat.

*(AIRPLANES BUNO. 156890 AND SUBSEQUENT AND AIRPLANES AFTER A-7 AIRFRAME CHANGE NO. 73) GROSS WEIGHT CENTER OF GRAVITY AT 29,823 POUND** WITH LANDING GEAR DOWN. AVERAGE WEIGHT EMPTY 18,752 FUSELAGE STATION 460.0

*(AIRPLANES BUNO. 156801 THROUGH BUNO. 156889 AND AIRPLANES BEFORE A-7 AIRFRAME CHANGE NO. 73) GROSS WEIGHT CENTER OF GRAVITY AT 29,567 POUNDS** WITH LANDING GEAR DOWN. AVERAGE WEIGHT EMPTY 18,496. FUSELAGE STATION 460.0

**Includes fuel, oil oxygen, pilot, guns, ammunition, and pylon replacement fairings

Figure 8. Airplane Dimensions

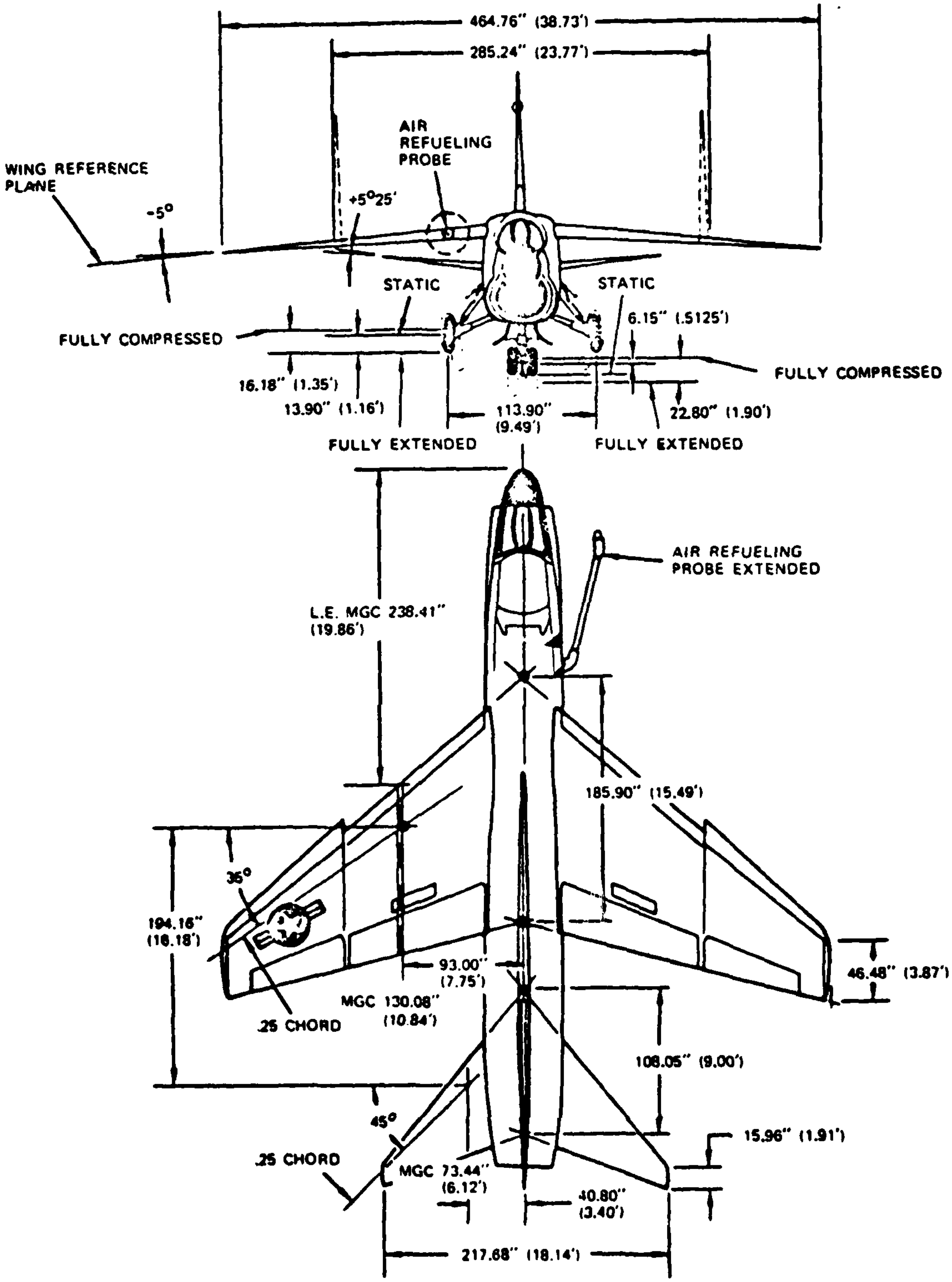


Figure 9. Airplane Dimensions

GENERAL

Wingspan	38.73 ft
Wingspan, folded	23.77 ft
Length, overall	46.16 ft
Main wheel tread	9.49 ft
Airplane gross weight (clean)	
BuNo. 156734 through 156800	28,661 LB*
BuNo. 156801 through BuNo. 156889, and airplanes before A-7 Airframe Change No. 73	29,567 LB*
BuNo. 156890 and subsequent, and airplanes after A-7 Airframe Change No. 73	29,823 LB*
Tire size	
Main wheels	28 x 9.0 – 12
Nose wheels	22 x 5.5

*Includes fuel, oil, oxygen, pilot, guns, ammunition and pylon replacement fairings

FUSELAGE

Height, basic outside	7.20 ft
Width, basic outside	4.88 ft
Length	44.18 ft

WING

Type	High
Chord at root	15.49 ft
Chord at tip	3.87 ft
Mean geometric chord at 7.75 ft from centerline of airplane	10.84 ft
Incidence	-1°
Dihedral	-5°
Aspect ratio	4.0
Sweepback of 1/4 chord line	35°

AILERONS

Type	Plain, sealed
Span	6.24 ft
Chord, percent wing chord/ft	
Inboard end	25/2.14
Outboard end	25/1.26
Maximum deflection	$\pm 25^\circ$

TAIL (HORIZONTAL)

Span	18.14 ft
Chord (MGC) at 3.40 ft from centerline	6.12 ft
Maximum deflection	
Leading edge up	6.75°
Leading edge down	26.5°
Sweepback of 1/4 chord line	45°
Dihedral	$5^\circ\ 25'$

TAIL (VERTICAL)

Span	12.87 ft
Chord (MGC)	10.20 ft
Sweepback of 1/4 chord line	44.28°

MAJOR CHANGE

RUDDER

Type	Plain, sealed
Chord, average	2.12 ft
Maximum deflection	
Flaps extended	24.5°
Flaps retracted	6°

HIGH LIFT AND DRAG INCREASING DEVICES

WING TRAILING EDGE FLAP

Type	Single slotted
Span	9.20 ft
Chord, percent of wing chord	22.55
Maximum deflection	40°

LEADING EDGE FLAP

Span	
Inboard	11.99 ft
Outboard	10.55 ft
Chord, percent of wing chord	
Inboard	12
Outboard	12
Maximum deflection	
Airplanes before AFC 369	35°
Airplanes after AFC 369	26°

SPOILER-DEFLECTOR

Location, percent of semispan	
Inboard end	28.94
Outboard end	43.46
Spoiler chord, percent of wing chord	
Inboard end	6.92
Outboard end	7.71
Maximum deflection	60°
Deflector, percent of wing chord	
Inboard end	5.07
Outboard end	5.88
Maximum deflection	30°

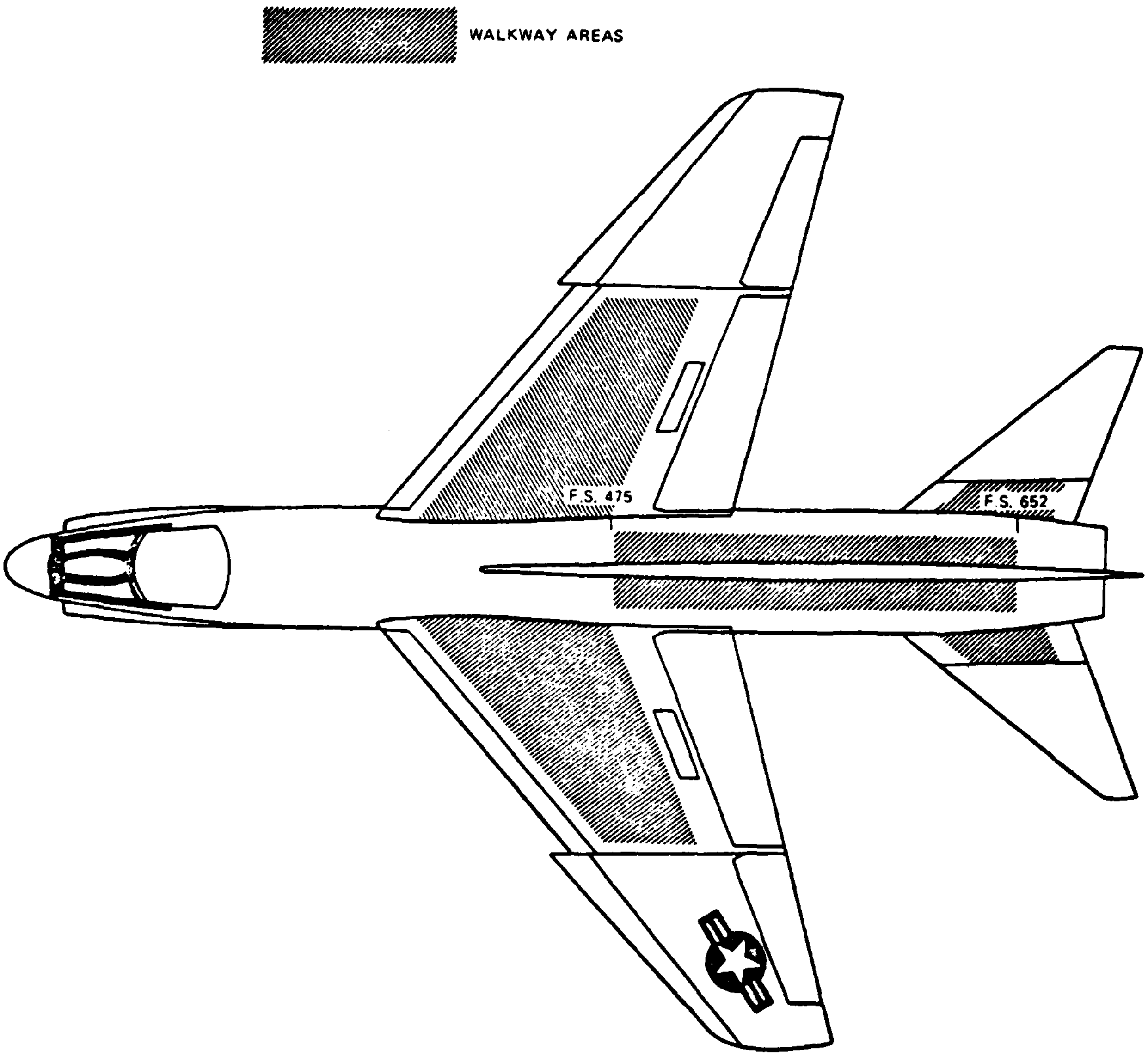
SPEED BRAKE

Maximum deflection	60°

AREAS

Wing	375 sq ft
Wing, trailing edge flap, each	21.74 sq ft
Leading edge flap	
Inboard section	18.36 sq ft
Outboard section	18.88 sq ft
Ailerons	19.94 sq ft
Spoiler	4.60 sq ft
Deflector	3.44 sq ft
Vertical stabilizer	115.20 sq ft
Rudder	15.04 sq ft
Horizontal stabilizer, exposed	56.39 sq ft
Speed brake	25.40 sq ft

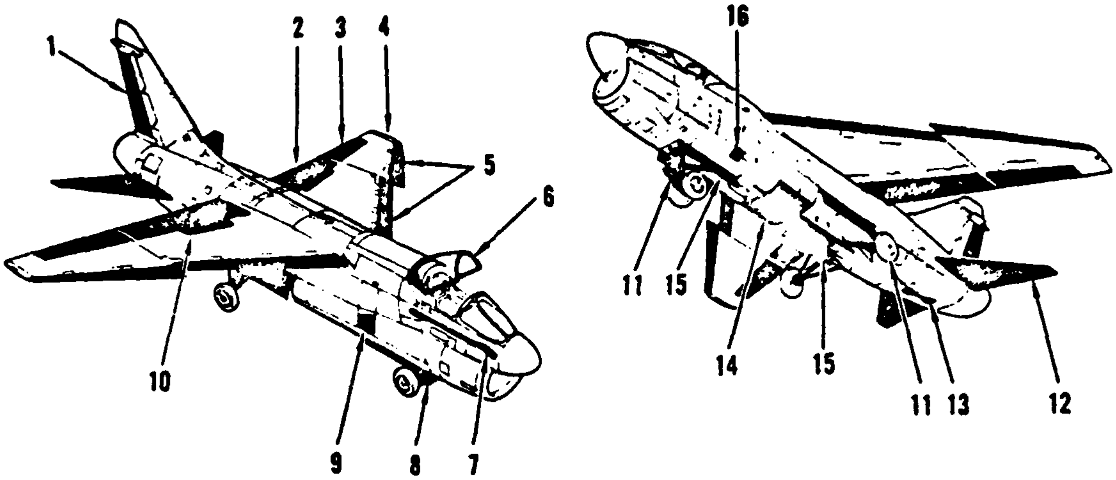
Figure 10. Airplane Dimensions



CAUTION

Walking on airplane surfaces other than those indicated by shading, climbing on or off UHT from ground level in the no-step areas, or jumping from fuselage to UHT may result in skin or internal structural damage.

Figure 11. Airplane Walkways



INDEX NO.	NOMENCLATURE
1.	Rudder • Hazard – Movement • Precaution – Stand clear
2.	Wing trailing edge flaps • Hazard – Movement • Precaution – Stand clear
3.	Aileron • Hazard – Movement • Precaution – Stand clear
4.	Outer wing panels • Hazard – Folding and spreading • Precaution – Stand clear
5.	Wing leading edge flaps • Hazard – Movement • Precaution – Stand clear
6.	Canopy • Hazard – Closing • Precaution – Install canopy support strut
7.	Air refueling probe • Hazard – Extension/retraction • Precaution – Stand clear
8.	Catapult launch bar • Hazard – Extension/retraction • Precaution – Stand clear
9.	Emergency power package • Hazard – Extension/retraction • Precaution – Stand clear
10.	Spoiler-deflectors • Hazard – Movement Precaution – Stand clear
11.	Nose and main landing gear • Hazard – Extension/retraction on jacks or retraction on ground • Precaution – Stand clear, install downlocks
12.	UHT • Hazard – Movement • Precaution – Stand clear
13.	Arresting gear • Hazard – Extension/retraction • Precaution – Stand clear
14.	Speed brake • Hazard – Extension/retraction • Precaution – Stand clear
15.	Main and nose landing gear doors • Hazard – Opening and closing with airplane on jacks • Precaution – Stand clear
16.	Gun gas purge door • Hazard – Open/close • Precaution – Stand clear

Figure 12. Movable Surface Hazards

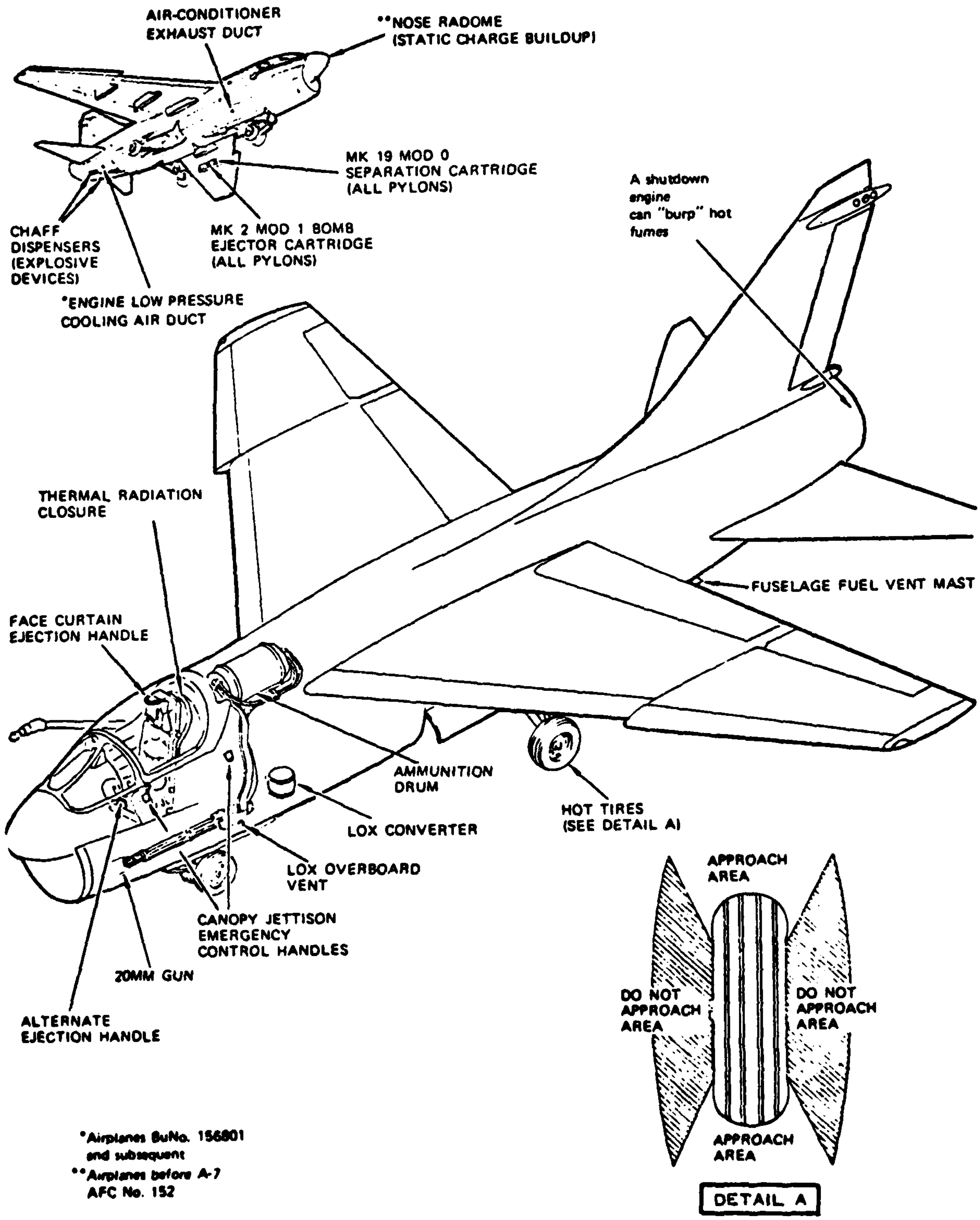


Figure 13. Danger Areas

WARNING

Connect electrical ground wire to airplane (figure 2) before connecting external electrical power.

To prevent dumping fuel on deck and endangering airplane and personnel by fire hazard, ensure fuel dump switch is in DE-SELECT position prior to applying external electrical power or starting airplane engine.

1. Ensure master generator switch in OFF-RESET.
2. Open access 1233-5.
3. If necessary to provide electrical power to several items of ground support equipment simultaneously, connect electrical power distribution box 218-01878-1 to the AN/ARW-77 test receptacle (access 1232-1) to provide switched AC and DC power from different type outlets.

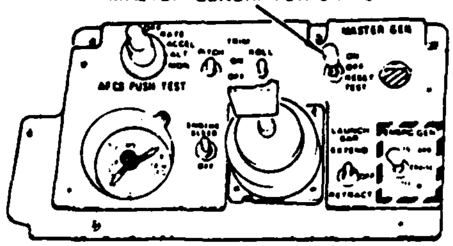
CAUTION

Prior to connecting external electrical power for routine airplane systems test, open circuit breakers CB3025, CB3030, and CB3133 for emergency accumulator heater blankets. This will prevent prolonged exposure of accumulators to heat and reduce possibility of O-ring damage.

NOTE

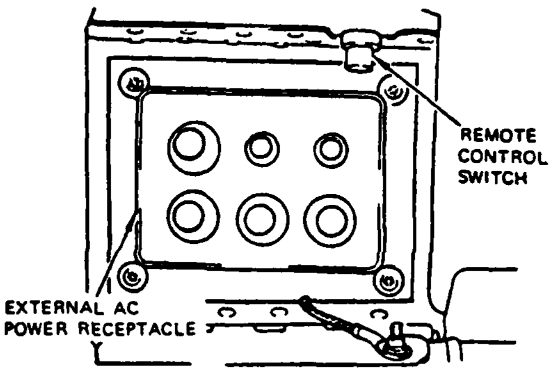
Ensure external power unit generator control switches are in the OFF position before connecting power cable to airplane.

4. Connect power cable from NC–5 powerplant or external power source to external power receptacle.
5. Start Model NC–5 (460R1–100) powerplant and operate in accordance with NAVAIR 19–45A–504 or apply external power.

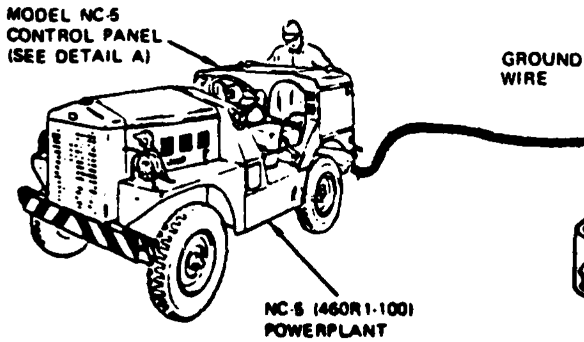


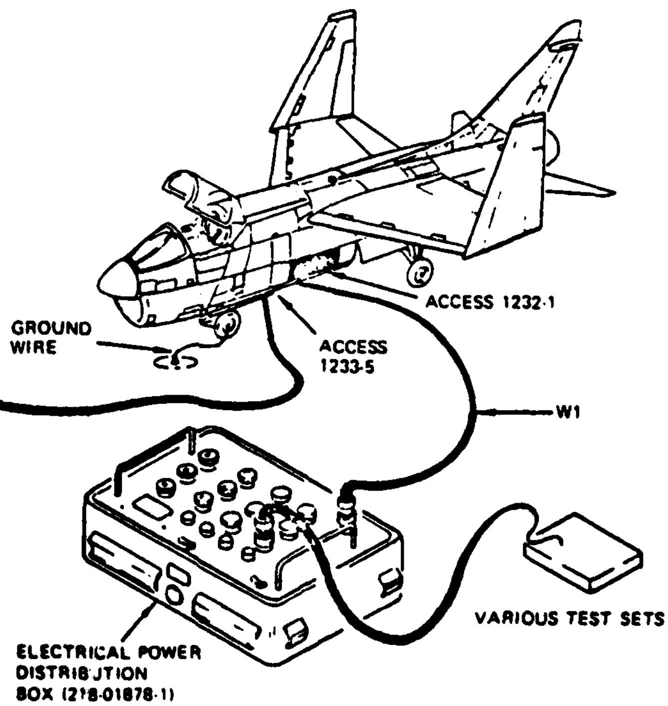
NOTE

To shut down and disconnect external electrical power, place master generator switch in OFF-RESET and reverse steps 2 through 5.



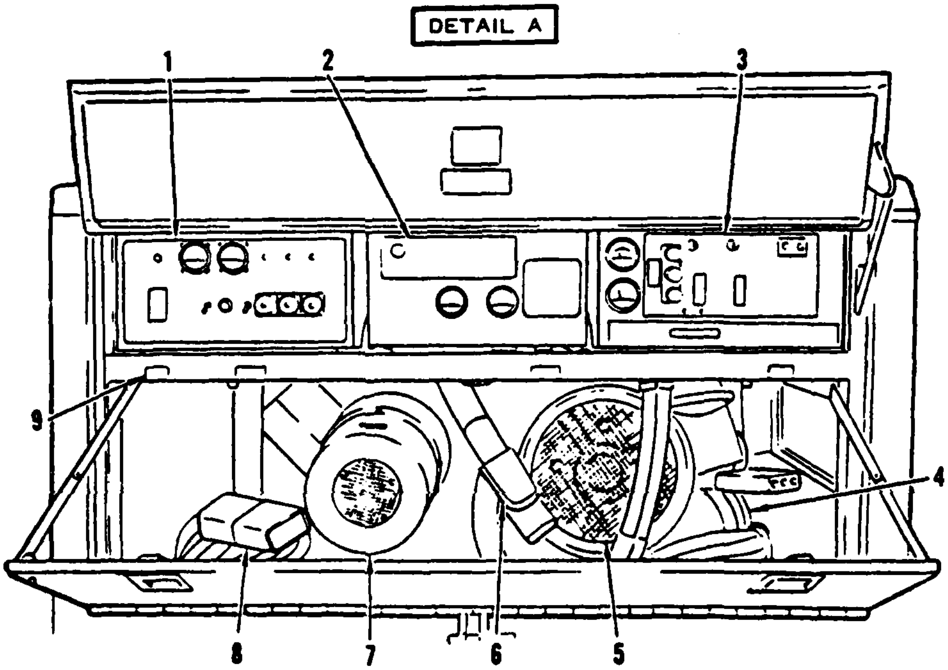
(ACCESS 1233-5)





6. Press and release remote control switch.
7. Place master generator switch in TEST.

Figure 14. Connecting External Electrical Power



1. AC control box
2. Transformer-rectifier control box
3. DC control box
4. Jet starting cable
5. DC generator
6. DC power cable
7. AC generator
8. AC power cable
9. Panel lights switch

NC-5 MOBILE ELECTRIC POWERPLANT CONTROL PANEL

Figure 15. Connecting External Electrical Power

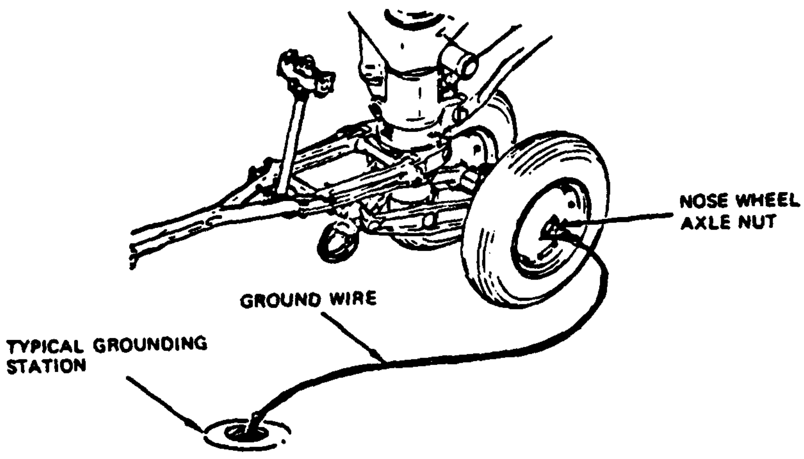


Figure 2. Airplane Electrical Grounding

3. CONNECTING EXTERNAL HYDRAULIC POWER. (Figure 3.)

SUPPORT EQUIPMENT REQUIRED

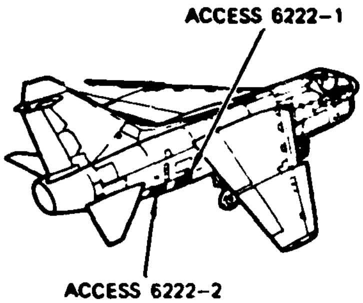
AHT-63 or AHT-64 hydraulic test stand

Equipment required for connecting external electrical power

4. For connecting power using the 218-01982-101 manifold, refer to paragraph 8. The manifold allows airplane PC systems to be pressurized from a single hydraulic test stand. Also, when required to cycle flight controls with only one PC system pressurized, use of the manifold prevents ingesting air into the unpressurized systems as the controls are cycled.

5. For an operation that requires only one PC system be pressurized (such as utility system maintenance) without flight control cycling, the 218-01982-101 manifold is not required and hydraulic power can be connected from hydraulic test stand in accordance with paragraph 9.

Figure 16. Airplane Electrical Grounding

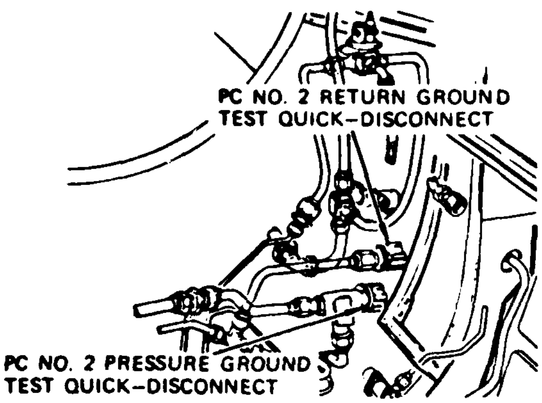


CAUTION

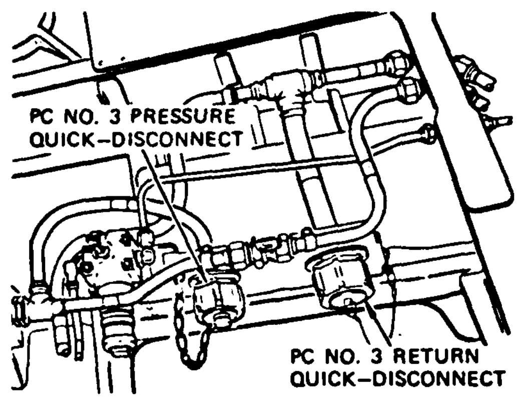
Ensure hydraulic pressure line filter bowl is installed on filter head before pressurizing system. Pressurizing the system above 200 psi will blow out diaphragm and diaphragm guide tube from filter head, allowing pressurized fluid flow from the system.

NOTE

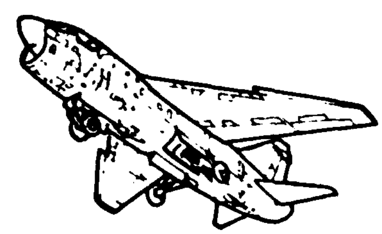
For detailed procedures, refer to connecting external hydraulic power, paragraph 3.

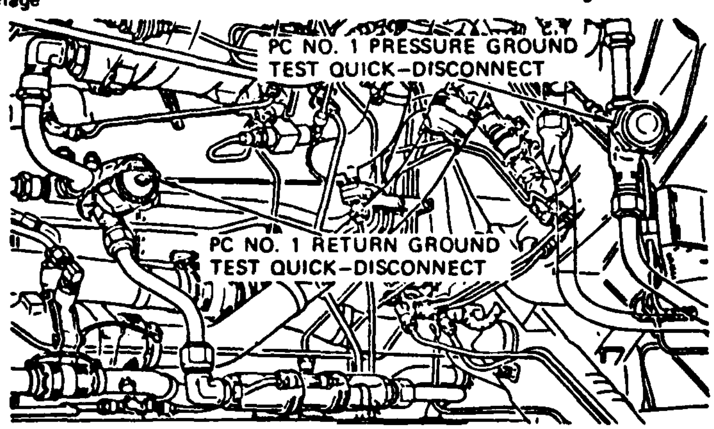


ACCESS 6222-1
PC No. 2 Quick-Disconnects are viewed from inside fuselage



ACCESS 6222-2
PC No. 3 Quick-Disconnects are viewed from inside fuselage.





LEFT WHEEL WELL

Figure 17. Connecting External Hydraulic Power

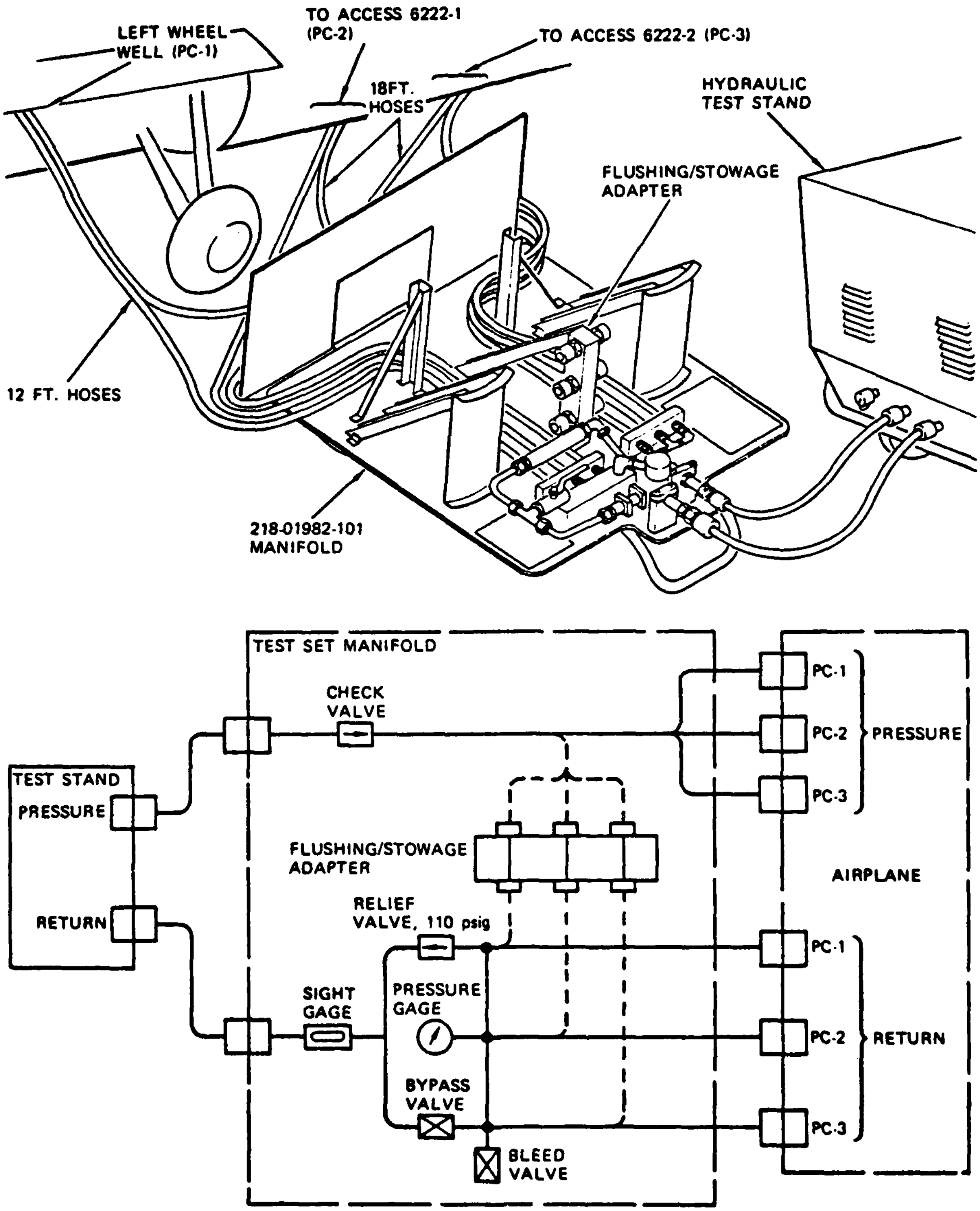


Figure 18. Connecting External Hydraulic Power

CONNECTING HYDRAULIC POWER WITH 218-01982-101 MANIFOLD

OPERATION/MAINTENANCE TO BE PERFORMED	CONNECT PRESSURE LINE	CONNECT RETURN LINE	TEST STAND RESERVOIR VALVE POSITION	MANIFOLD BYPASS VALVE POSITION
1. FLIGHT CONTROLS OPERATION WITH POWER APPLIED TO:				
A. ALL 3 PC SYSTEMS*	PC-1,2, AND 3	PC-1,2, AND 3	TEST STAND	CLOSED
B. PC-1 ONLY	PC-1	PC-1,2, AND 3	TEST STAND	CLOSED
C. PC-2 ONLY	PC-2	PC-1,2, AND 3	TEST STAND	CLOSED
D. PC-3 ONLY	PC-3	PC-1,2, AND 3	TEST STAND	CLOSED
E. COMBINATION	AS REQUIRED	PC-1,2, AND 3	TEST STAND	CLOSED
2. UTILITY SYSTEMS OPERATION**	PC-2	PC-2	AIRCRAFT ##	OPEN
3. GUN OR AIR REFUEL-ING PROBE OPERATION**	PC-2	PC-2	AIRCRAFT ##	OPEN
4. HYDRAULIC SYSTEM BLEEDING (WP029 00)	PC-1,2, AND 3	PC-1,2, AND 3	TEST STAND	OPEN
5. COMPONENT BLEEDING	TO SYSTEM(S) BEING BLED	PC-1,2, AND 3	TEST STAND	#
6. EMERGENCY ACCUMU-LATOR CHARGING**	PC-2	PC-2	AIRCRAFT ##	OPEN
7. RESERVOIR DRAINING**	TO SYSTEM(S) BEING DRAINED	TO SYSTEM(S) BEING DRAINED	TEST STAND	OPEN

NOTE

WHEN USING TEST SET MANIFOLD, TEST STAND BACK PRESSURE VALVE SHOULD BE SET TO MINIMUM PRESSURE (FULL COUNTERCLOCKWISE).

*AIRPLANES WITH ONLY PC-1 AND PC-2 SYSTEMS MAY ALSO USE MANIFOLD BY CONNECTING INTO THOSE SYSTEMS AND LEAVING PC-3 LINES DISCONNECTED FROM MANIFOLD STOWAGE ADAPTER.

**FLIGHT CONTROLS SHOULD NOT BE CYCLED.

#CLOSE BYPASS VALVE FOR ALL COMPONENT BLEEDING EXCEPT FLIGHT CONTROL ACTUATORS. OPEN VALVE FOR FLIGHT CONTROL ACTUATOR BLEEDING.

##IF AIRPLANE RESERVOIR DEPLETES, OPERATE WITH TEST STAND VALVE IN TEST STAND (OPEN SYSTEM) AND MANIFOLD BYPASS VALVE CLOSED.

Figure 19. Connecting External Hydraulic Power

CONNECTING HYDRAULIC POWER WITHOUT 218-01982-101 MANIFOLD

OPERATION/MAINTENANCE TO BE PERFORMED	CONNECT PRESSURE LINE	CONNECT RETURN LINE	HYDRAULIC TEST STAND OPERATION	
			RESERVOIR VALVE POSITION	RETURN BACKPRESSURE
1. FLIGHT CONTROLS OPERATION (ALL PC SYSTEMS MUST BE POWERED)*	PC-1,2, AND 3	PC-1,2, AND 3	TEST STAND	NONE
2. UTILITY SYSTEMS OPERATION**	PC-2	PC-2	AIRCRAFT #	NONE
3. GUN OR AIR REFUELING PROBE OPERATION**	PC-2	PC-2	AIRCRAFT #	NONE
4. HYDRAULIC SYSTEM BLEEDING (WP029 00)	PC-1,2, AND 3	PC-1,2, AND 3	TEST STAND	NONE
5. COMPONENT BLEEDING	TO SYSTEM(S) BEING BLED	TO SYSTEM(S) BEING BLED	TEST STAND	NONE
6. EMERGENCY ACCUMULATOR	PC-2	PC-2	AIRCRAFT #	NONE
7. RESERVOIR DRAINING**	TO SYSTEM(S) BEING DRAINED	TO SYSTEM(S) BEING DRAINED	TEST STAND	NONE

* REQUIRES HYDRAULIC TEST STAND FOR EACH PC SYSTEM. REFER TO MANIFOLD PROCEDURE TO APPLY POWER FROM A SINGLE TEST STAND OR WHEN REQUIRED TO CYCLE FLIGHT CONTROLS WITHOUT ALL PC SYSTEMS POWERED.

** FLIGHT CONTROLS SHOULD NOT BE CYCLED.

\# IF AIRPLANE RESERVOIR DEPLETES, OPERATE TEST STAND WITH RESERVOIR VALVE IN TEST STAND POSITION.

Figure 20. Connecting External Hydraulic Power

TOWBAR INSTALLATION

1. Spread towbar tubes apart and install 3/4-inch tow pin.
2. Pull towbar tubes together to fit tow pins into nose gear axle ends.
3. Install detent pins in towbar tubes and through the tow pins. This locks the tow pins in place.
4. Slide towbar chain through towbar tube sleeve and pull tight; then engage nearest link in slot on the tube.
5. Tighten chain to maximum tension with knob.
6. Store fid in grommeted hole so that chain will not drag.
7. Place towbar towing ring on tractor pintle hook.

NOTE

To remove the towbar, reverse steps 1 through 7. To tow the airplane, refer to towing, this section.

CAUTION

Before towing airplane, ensure that chain is under maximum tension and that knob has not reached the end of its travel before chain is tight.

NOTE

If airplane is to be pushed manually, push only on landing gear struts or leading edge of horizontal tail.

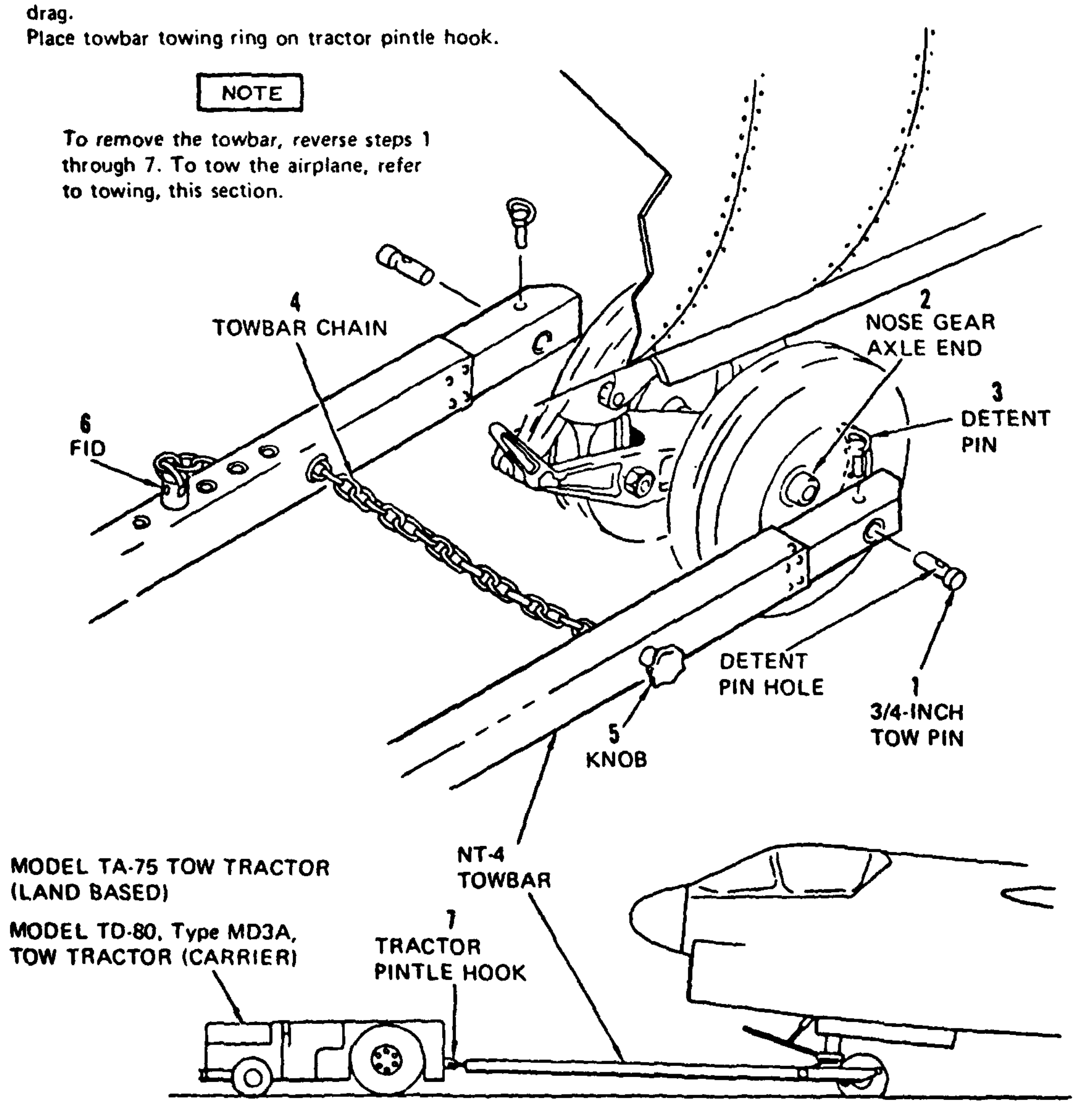


Figure 21. Towing Sheet

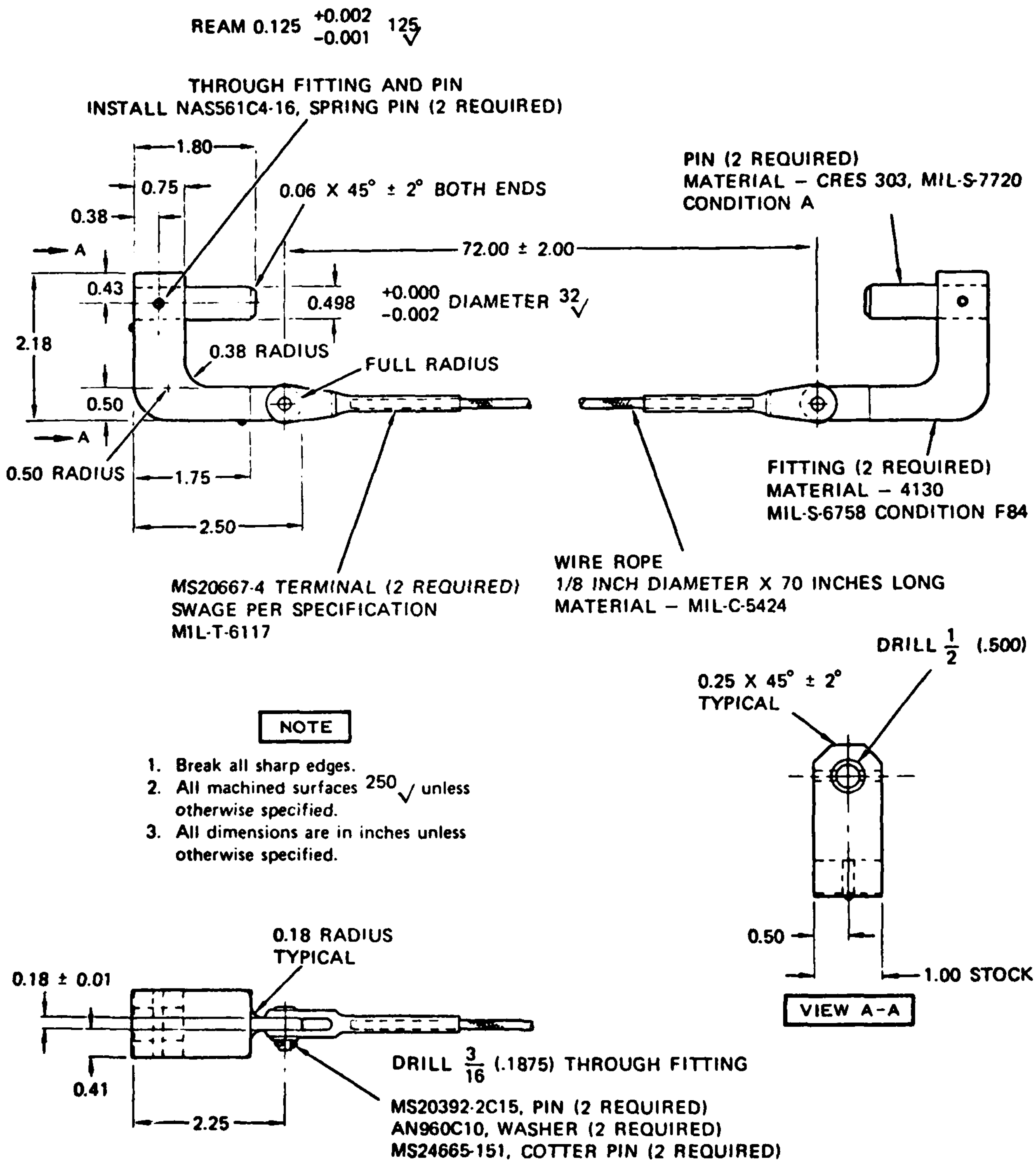


Figure 22. Towing Sheet

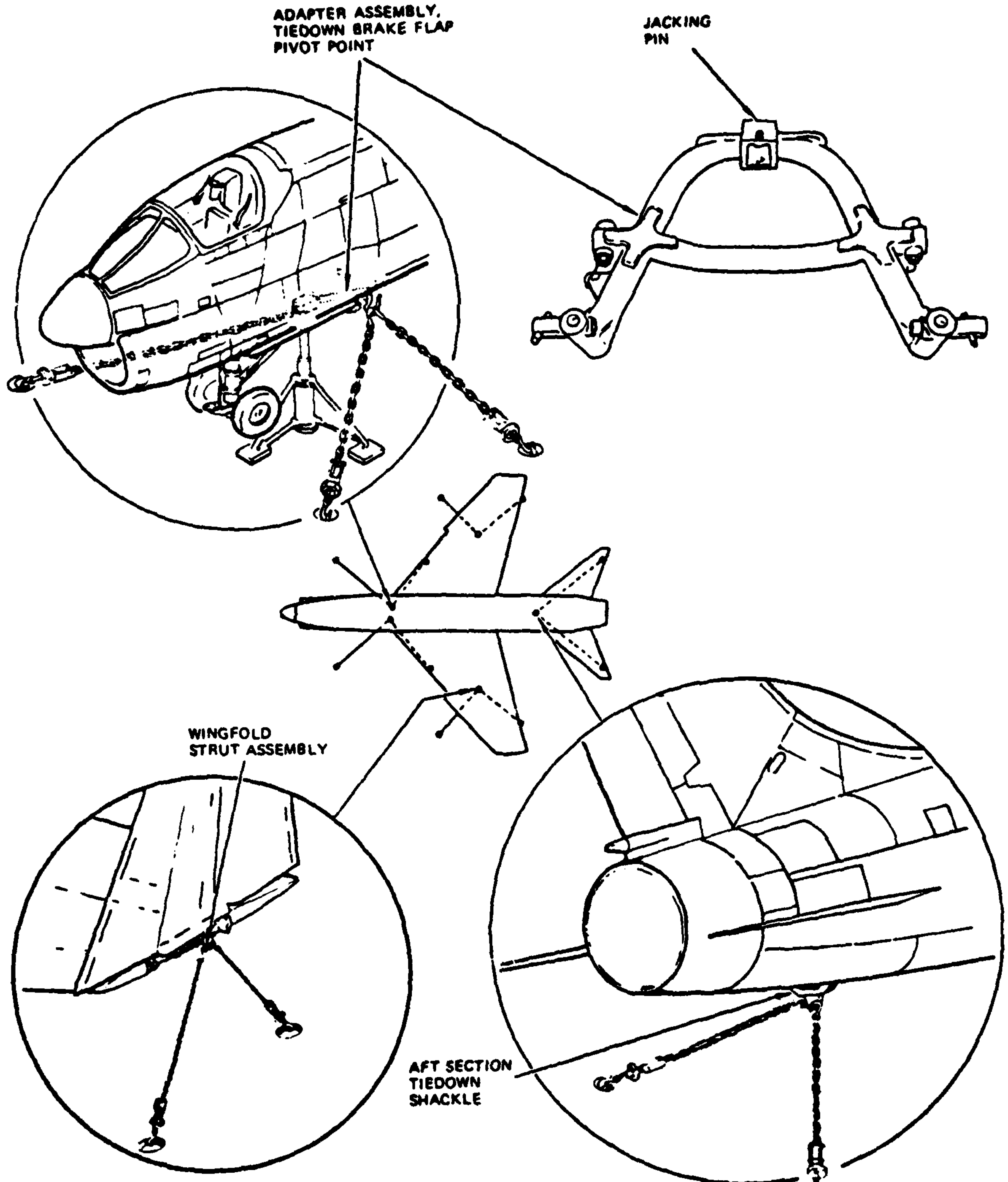
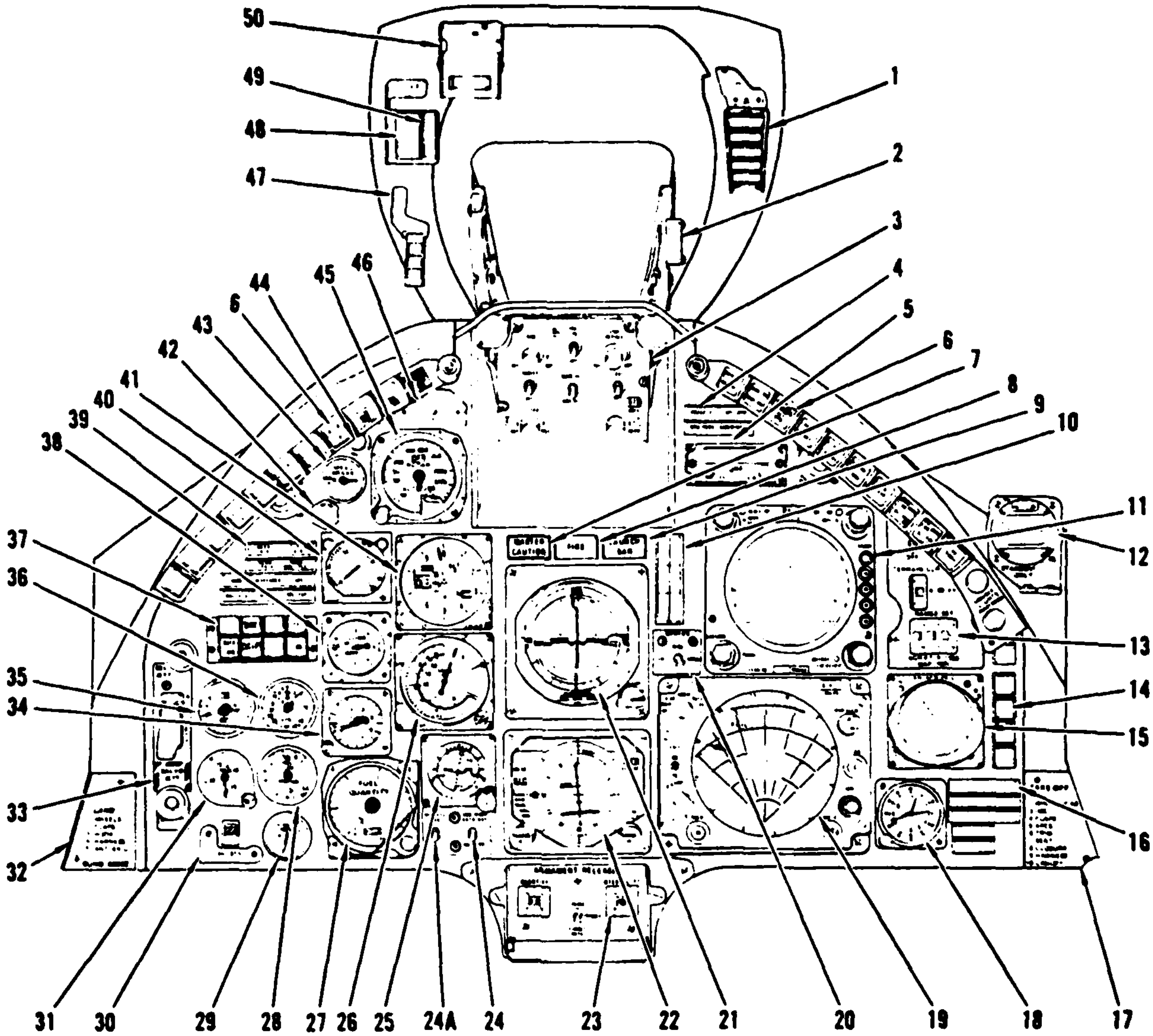
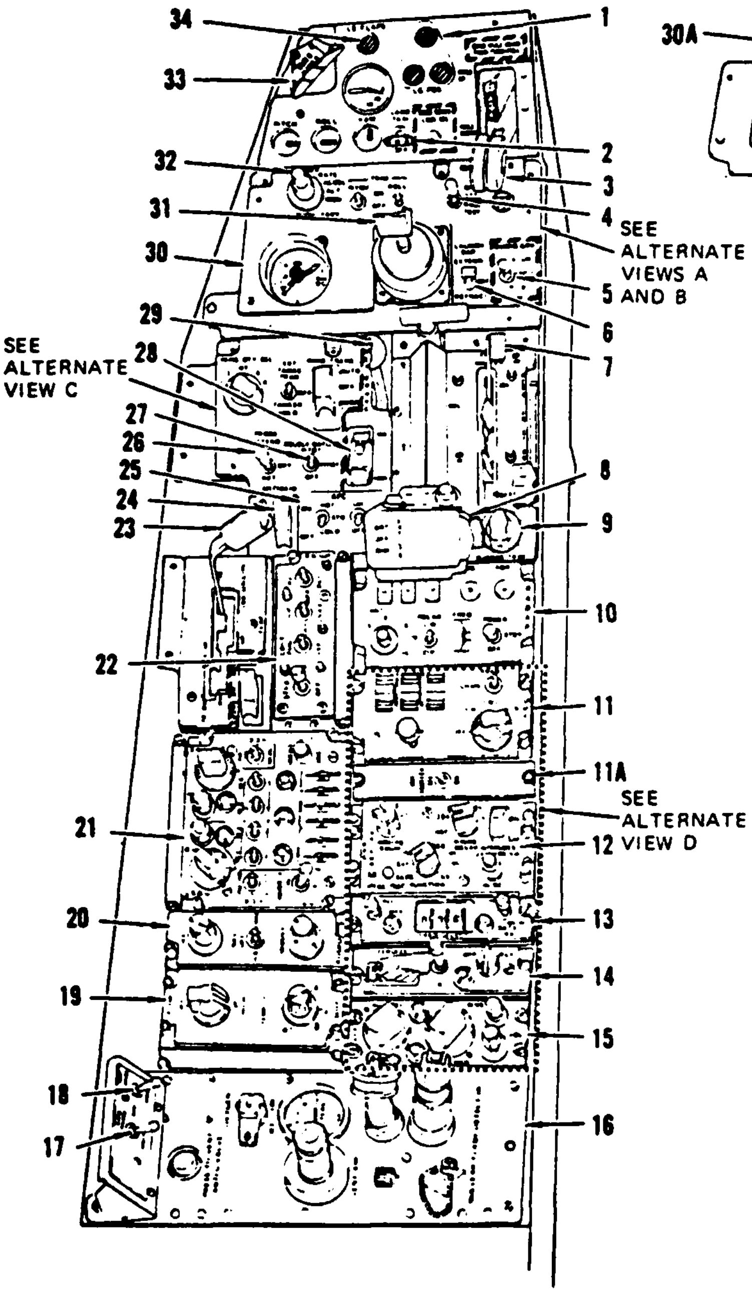


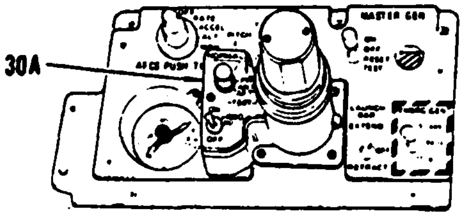
Figure 23. Tiedown - Jacked Airplane



1. Threat lights
2. In range light
3. Head-Up Display controls
4. Armament advisory lights
5. UHF frequency indicator
6. Armament selectors
7. Master caution light
8. Fire warning light
9. Launch bar light
10. Data Link discrete lights
11. Radar scope
12. Standby compass
13. Radar controls, gyro erect
14. RHAW warning lights
15. ECM threat analyzer
16. Data Link discrete lights
17. Takeoff checklist
18. Clock
19. Projected Map Display
20. Shrike switch

Figure 24. Instrument Panel Area - TF30-P-408 Typical





ALTERNATE VIEW A

1. Landing gear position indicator
2. Land Taxi light switch
3. Landing gear handle
4. Master generator switch
5. Emergency generator switch
6. Launch Bar switch
7. Fuel Master handle
8. Throttle
9. Rudder Trim control
10. Radar controls
11. Command radio controls

11A. UHF squelch

†12. Fuze function control

13. Data Link controls
14. Speech security controls
15. UHF-ADF radio
16. Pilot services panel
17. SINS Align switch
18. ADF Guard switch (airplanes through BuNo. 160001)
    UHF XMT switch (airplanes BuNo. 160002 and subsequent)
19. Suit temperature control
20. Audio control
21. IFF controls
22. AFCS
23. Flap handle
24. Anti-Skid switch
25. APC controls
26. Probe switch
27. Anti-Ice switch (before AFC No. 288)
    Double datum lockout switch (after AFC No. 288)
28. Fuel Control switch
29. Emergency Brake handle
30. Pitch and roll trim indicator

30A. C-9743/AWW guided weapon control (after AVC No. 1782)

31. Slew control (before AVC No. 1782)
32. AFCS Push Test
33. Emergency Power handle
34. Flap indicators
35. Main AN/ARC-159(V) radio set control
36. Auxiliary AN/ARC-159(V) radio set control
37. Engine bleed switch

†Replaced with AMAC Special Weapons, AERO 14B Spray Tanks, D-704 or Sargent Fletcher Model 31-300 Air Refueling Store Control panel when aircraft is loaded with these stores.

Figure 25. Left Console Area

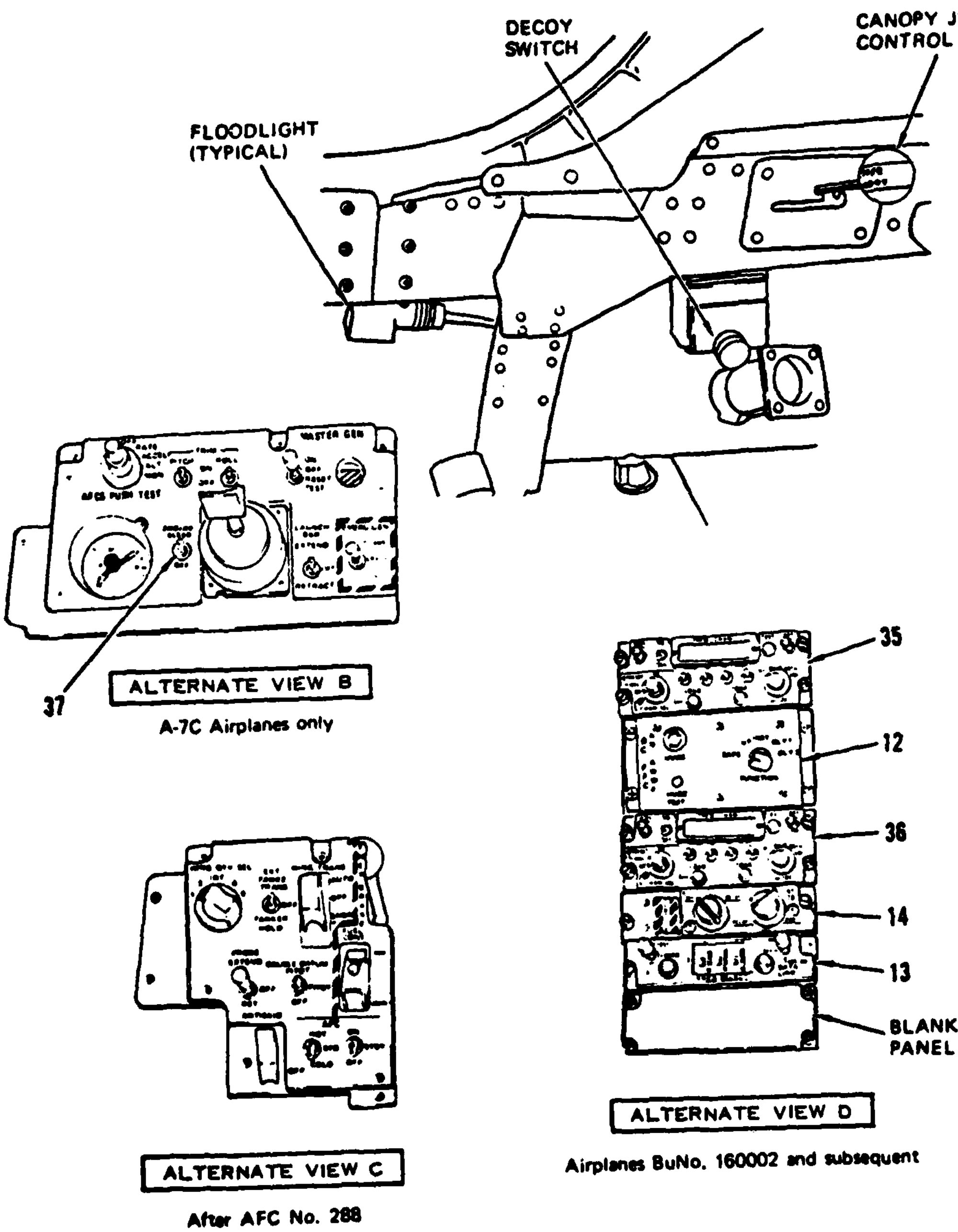
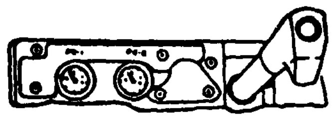
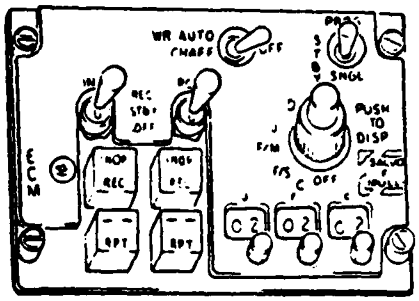


Figure 26. Left Console Area



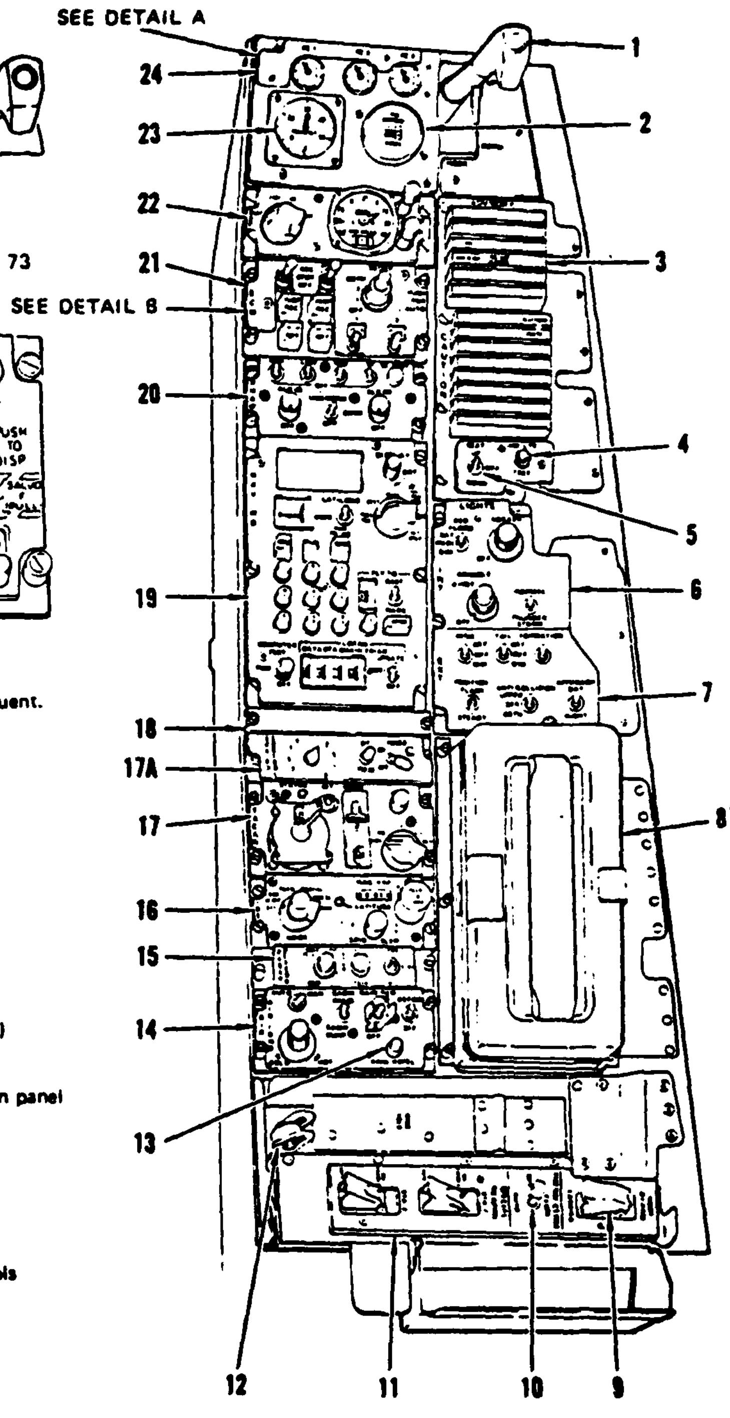
DETAIL A

Before Airframe Change No. 73



DETAIL B

Airplanes BuNo. 159691 and subsequent.



1. Arresting hook handle
2. True airspeed indicator
3. Caution and advisory light panels
4. Indicator light test switch
5. Seat adjust switch
6. Interior lights controls
7. Exterior lights controls
*8. Map case
9. Hook By-pass switch
10. Thermal closure switch
11. Special Weapon switches (2 and 7)
12. Wingfold controls
13. Rain Repellent button
14. Air-conditioning and pressurization panel
15. Radar Beacon controls
16. IMS controls
17. TACAN controls
17A. Precision Approach controls (after Airframe Change No. 241)
18. Blank panel
19. Tactical Computer control panel
20. Radar homing and warning controls
21. ECM controls
22. Doppler controls
23. Cabin pressure altimeter
24. Hydraulic pressure indicators

*Open well on airplanes BuNo. 159308 and subsequent.

Figure 27. Right Console Area

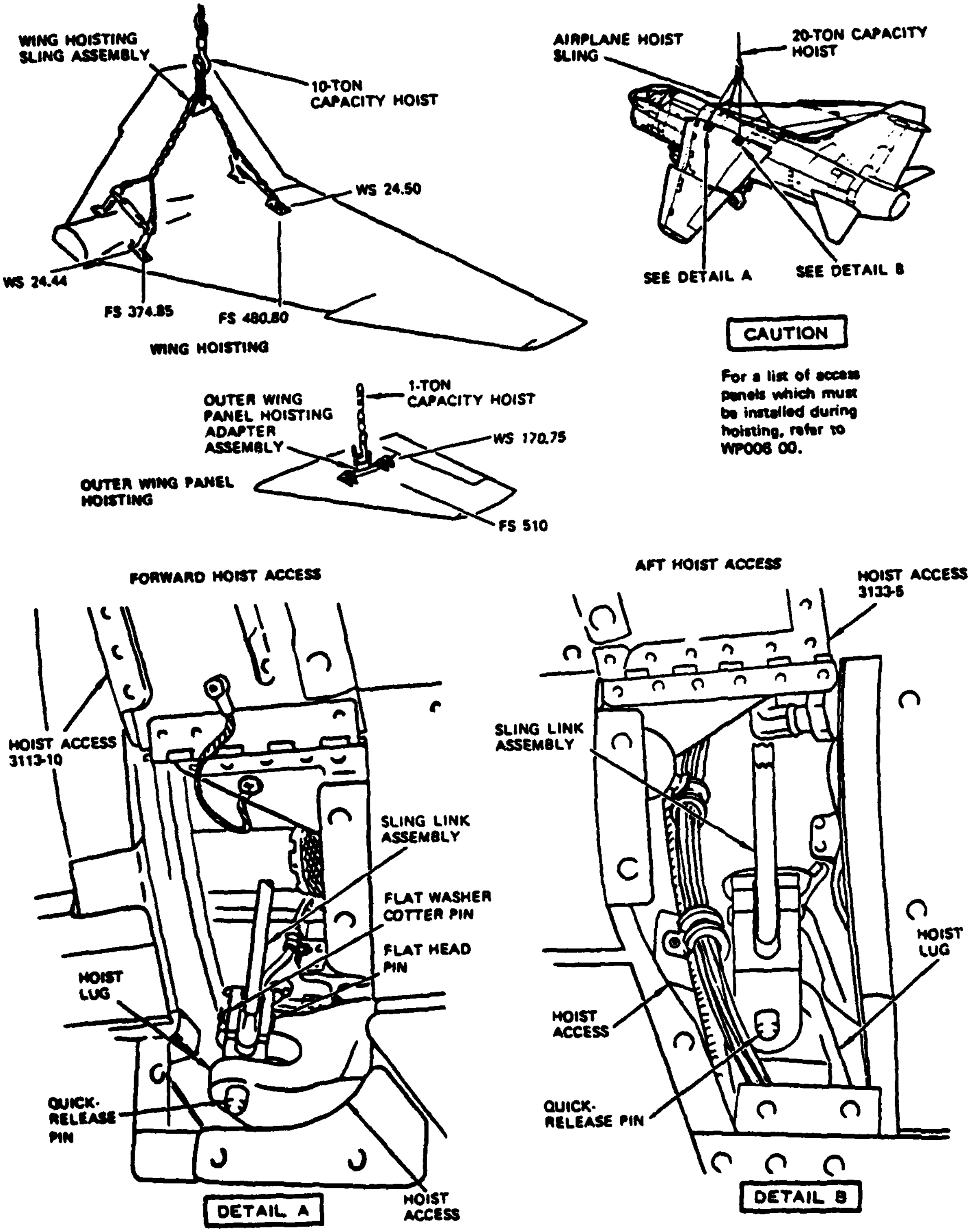


Figure 28. Hoisting

LEVELING AND MEASURING PROCEDURE

1 Open access door 2232-1 (right avionics compartment).

2 Place lateral spirit level on inboard-outboard leveling pads.

3 Place longitudinal spirit level on forward-aft leveling pads.

NOTE

Refer to airplane jacking, this WP for jacking procedure.

4 Jack airplane as required to center each spirit level bubble. When bubbles are centered, airplane will be longitudinally and laterally level.

5 To obtain a measurement reference line for locating airplane stations and frames after the airplane is level, suspend a plumb bob from bracket located on forward end of each main gear well. Suspended plumb bob string can then be used as reference line for locating airplane stations and frames.

6 When required maintenance is accomplished, lower airplane and remove jacks.

7 Remove longitudinal spirit level from forward-aft leveling pads.

8 Remove lateral spirit level from inboard-outboard leveling pads.

9 Check right avionics compartment for cleanness and freedom from foreign objects.

10 Close access 2232-1, and check for security.

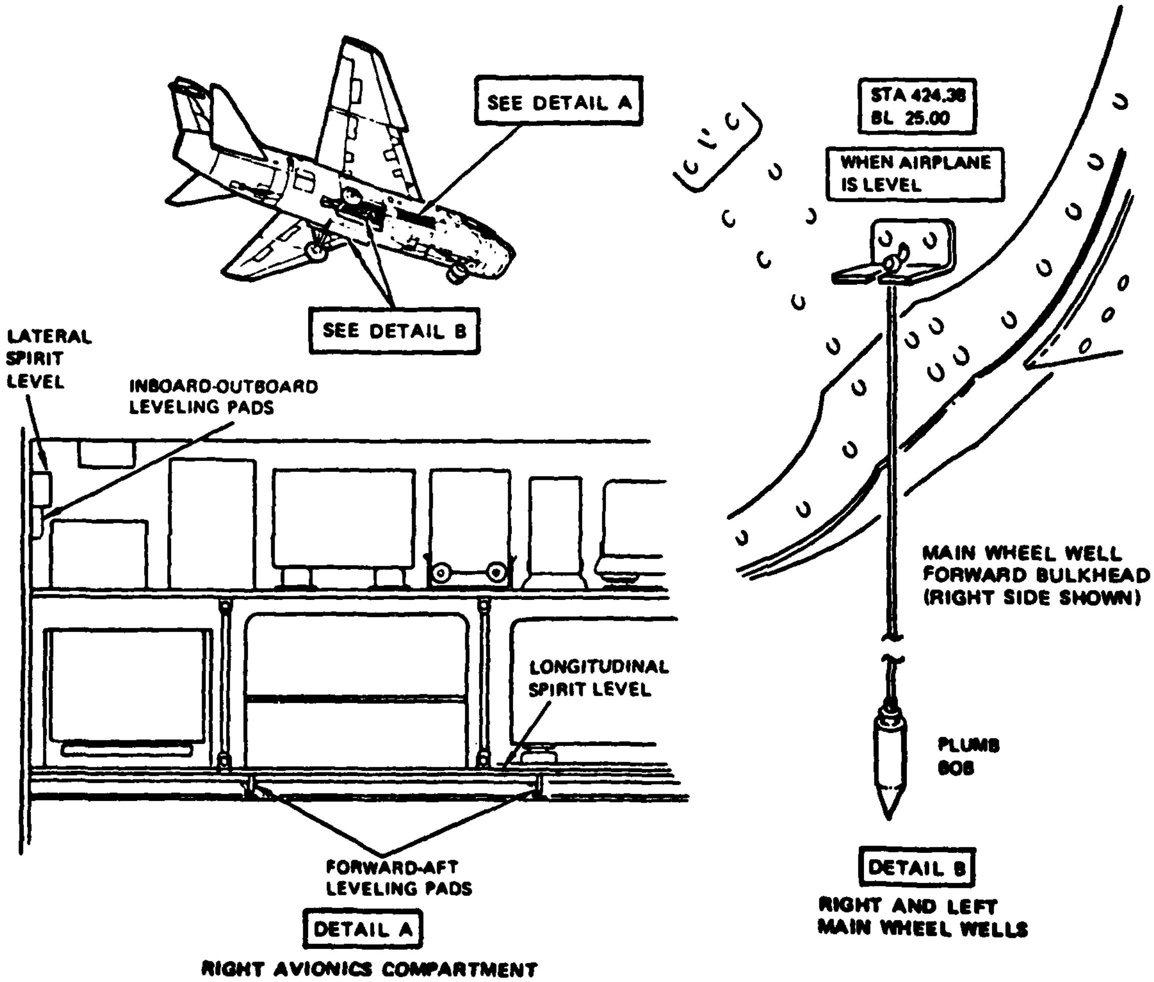


Figure 29. Airplane Leveling and Measuring

HAZARD ANALYSIS FORMS

The hazard analysis is contained in tabular form in the following pages, tables 2 through 9, of this section. The format for these forms is similar to the recommended for use in AFWL Regulation 127-1.

The following definitions for hazard classifications and validation are included here for general information:

a. Hazard Classification - This column provides a qualitative measure of significance for the potential effect of each identified hazardous condition, according to the following criteria:

Class IV - SAFE - Condition(s) such that personnel error, deficiency/inadequacy of design, or malfunction will not produce equipment damage or personnel injury.

Class III - MARGINAL - Condition(s) such that personnel error, deficiency/inadequacy of design, or malfunction will degrade performance, but which can be counteracted or controlled without major damage or injury to personnel.

Class II - CRITICAL - Condition(s) such that personnel error, deficiency/inadequacy of design, or malfunction will degrade performance, injure personnel, damage equipment or will result in a hazard requiring immediate corrective action for personnel or equipment survival.

Class I - CATASTROPHIC - Condition(s) such that personnel error, deficiency/inadequacy of design, or malfunction will severely degrade performance and cause subsequent equipment loss and/or death or multiple injuries to personnel.

b. Validation - This column is provided to record validated preventive measures and keep cognizant of the status of the recommended preventive measures, according to the following criteria: The column should be completed by resolving two questions:

(1) has the recommended solution been incorporated, and

(2) is the solution effective?

TABLE 2

AIRCRAFT (A/C) ARRIVAL DEPARTURE ACCOMMODATION

MODE	HAZARDOUS ELEMENT	EVENT CAUSING HAZARDOUS CONDITIONS	HAZARDOUS CONDITION	EVENT CAUSING POTENTIAL ACCIDENT	POTENTIAL ACCIDENT	EFFECT	HAZARD CLASS.	ACCIDENT PREVENTION MEASURES		
								HARDWARE	PROCEDURES	PERSONNEL
1a Ground handling, parking, servicing, transportation, of Aircraft	Aircraft	Aircraft in motion (towing)	Movement of heavy & large objects	(Similar to Column 3, event causing hazardous condition.)	Airplane Damage	Damage	II	Tow & Towbar	AF Tech Manuals	Trained Personnel
								Warning Vehicle(s)	Coordinate with HPD O&M Contractor	Observers
			Obstacles in path. Low traction surfaces		Personnel Injury/ Death	Injury/ Death	II or I		Path Clearance (Inspection)	
									Path Clearance (Inspection)	
			Inclement Weather (Rain/ Winds & Poor Visibility						Safety Criteria Meteorological data and Forecast	
SUBSYSTEM OR FUNCTION: A/C Arrival/Departure Accommodation										
1b Parking @ HPD Site of Aircraft (A/C)	Unsecured nearby objects or A/C moving.	Weather (Winds)	Movement of objects colliding with A/C	(Similar to Column 3)	Airplane Damage	Damage	II	Tie-down provisions available (Wheel Chocks)	Safety Criteria & Inspection	Checklists Observance
Parking (A/C) (Secure & Safe)	Power Cart, Work Stands (etc.)	Weather (Winds)	Movement of cart colliding with A/C	(Similar to Column 3)	Airplane Damage	Damage	II	Tie-down provisions available (Wheel Chocks)	Safety Criteria & Inspection	Checklists Observance
	Elect. Power Connections	Improper (unsafe) Connection	Electric shock	(Similar to Column 3)	Personnel Injury/ Death	Injury/ Death	II or I	Power Cart, A/C Power Jack	AF Tech Manuals	Checklist Observance
A/C Interior	Heat	Weather-lack of AC, lack of venting	Hot equipment. Personnel Uncomfort	(Similar to Column 3)	Personnel Exhaustion	Discomfort	III or II	AC Open A/C Doors		General requirements: Watches and rings removed. Safety shoes Two-man policy

TABLE 2 (Continued)

MODE	HAZARDOUS ELEMENT	EVENT CAUSING HAZARDOUS CONDITIONS	HAZARDOUS CONDITION	EVENT CAUSING POTENTIAL ACCIDENT	POTENTIAL ACCIDENT	EFFECT	HAZARD CLASS.	ACCIDENT PREVENTION MEASURES: HARDWARE	ACCIDENT PREVENTION MEASURES: PROCEDURES	ACCIDENT PREVENTION MEASURES: PERSONNEL
1c A/C Flyaway	A/C	A/C in Flight	Electrical Fire (Improper Elec. Connect.)	(Same as Column 3)	Aircraft Loss	Loss	I		Flyaway Preps. & Funct. Test AF Tech Manuals	Trained Personnel
					Personnel Death	Death	I			
A/C Taxing	A/C Wheels	A/C Take-Off	Poor Wheel Condition	(Same as Column 3)	Aircraft Damage	Damage or Loss	I	Spare Tires, etc.	Wheel Inspection (Pre-Flt. Check-lists)	Trained Personnel
					Personnel Death	Injury or Death	I			
SUBSYSTEM OR FUNCTION: Aircraft Arrival/Parking										
1d A/C Parking	A/C	Inclement Weather (Lightning)	A/C & Personnel exposed to lightning stroke/high voltage	(Same as Column 3)	Aircraft Damage	Damage	II	Lightning Protection Devices	AF Tech Manuals	
					Personnel Injury/ Death	Injury	I	Grounding Provisions		
			Conducting Path between A/C & Personnel A/C Damage					(Nearby Tall Objects Provide Protection)		
SUBSYSTEM OR FUNCTION: A/C Transportation (Towing)										
2a A/C Transportation	Aircraft	Aircraft in Motion (towing)	Movement of heavy & large objects	(Same as Column 3)	Aircraft Damage	Damage	II	(Similar to A/C transportation during arrival)		
					Personnel Injury or Death	Injury/ Death	II			
Into HPD				(Same as Column 3)	Personnel Injury or Death	Injury/ Death	II	(Including Albq. Coordination)		
				(Same as Column 3)	Per. Inj. or Death	Injury/ Death	II	(Traffic Control of Trestle Vehicles)		

TABLE 3

AIRCRAFT INTO HPD FACILITY

MODE	HAZARDOUS ELEMENT	EVENT CAUSING HAZARDOUS CONDITIONS	HAZARDOUS CONDITION	EVENT CAUSING POTENTIAL ACCIDENT	POTENTIAL ACCIDENT	EFFECT	HAZARD CLASS.	ACCIDENT PREVENTION MEASURES		
								HARDWARE	PROCEDURES	PERSONNEL
2b $\overline{\text{A}}$/C Into HPD	A/C	A/C In Motion	Insuffi- Clearance	(Same as Column 3)	Aircraft Damage	Damage	II		Coordination with HPD O&M Contractor	
			Failure to Stop		Personnel Injury/ Death	Injury/ Death	II or I			
			Collisions Working Volume Not Clear Tow-way Not Clear						Traffic Control of Trestle Vehicles	
					SUBSYSTEM OR FUNCTION:			A/C Into HPD		
2c $\overline{\text{A}}$/C Into HPD (Parking)	A/C	Parking Position Maneuver	Nearby Objects-Collisions	(Same as Column 3)	Aircraft Damage	Damage	II		Warning No Pulser Firing Allowed	
			Insufficient Clearance, e.g., DASET Van, S^3 (high, mobile sensor support stand,		Personnel Injury/ Death	Injury/ Death	II or I			

TABLE 4

AIRCRAFT INTO VPD (BACKUP TEST FACILITY)

MODE	HAZARDOUS ELEMENT	EVENT CAUSING HAZARDOUS CONDITIONS	HAZARDOUS CONDITION	EVENT CAUSING POTENTIAL ACCIDENT	POTENTIAL ACCIDENT	EFFECT	HAZARD CLASS.	ACCIDENT PREVENTION MEASURES: HARDWARE	ACCIDENT PREVENTION MEASURES: PROCEDURES	ACCIDENT PREVENTION MEASURES: PERSONNEL
2d A/C Into VPD (If required) Transportation Parking	A/C	A/C Motion	Uncontrolled Motion (Collisions)	(Same as Column 3)	Aircraft Damage	Damage	II		Similar to A/C Transportation to HPD.	
Site-to-Site - HPD to VPD Into VPD		A/C Maneuver			Personnel Injury or Death	Injury or Death	II or I		Similar to A/C Parking at HPD when A/C arrives.	
					SUBSYSTEM OR FUNCTION: A/C Maintenance					
3a A/C Equip. Functional Checks	Lightning or EMP Pulsing				Personnel Injury/ Death	Injury/ Death	II or I	(Fire Extinguishers)	Safe Area selected for function/Mode Meteorological Data & Forecast	
	Static Electricity	(Inclement Weather)		(Same as Column 3)	Aircraft Damage	Damage	II	Insure good grounds		With respect to all operations, check grounding procedures.
					Personnel	Injury	II or I			
					SUBSYSTEM OR FUNCTION: A/C Maintenance					
3b Functional Checks of A/C Equipment	Onboard high electrical power (AC Generators)	Onboard AC Generators Operating	Personnel Electric Shock						Trained Personnel on-board only. (First Aid Practice)	
	Engine (Fire)	Engine Malfunction	Engine Fire, Fuel Leaks	(Same as Column 3)	Aircraft Damage or Loss	Damage or Loss	II or I	Fire Extinguishers	AF Tech Manuals	A/C Observation during engine runs
	Engine	Engine Runs	Noise Jet Wash, Debris						Safety Criteria Adherence	

TABLE 5

AIRCRAFT MAINTENANCE

MODE	HAZARDOUS ELEMENT	EVENT CAUSING HAZARDOUS CONDITIONS	HAZARDOUS CONDITION	EVENT CAUSING POTENTIAL ACCIDENT	POTENTIAL ACCIDENT	EFFECT	HAZARD CLASS.	ACCIDENT PREVENTION MEASURES: HARDWARE	PROCEDURES	PERSONNEL
3c										
*Mission Onboard Equipment Functionally Checked Using Power Cart	Inerting A/C Fuel, identical to same function listed under Test Preps Sheet 4a)									
4a A/C Preps for EMP Testing (Parked @ HPD)	Inerting A/C Fuel System	High Pressure N_2	High Pressure System Operation	(Same as Column 3)	Personnel Injury/ Death	Injury or Death	II or I	A-7E Std. Support Equipment	AF Tech Manuals	Trained Personnel
		Lightning or EMP Pulsing (Sparks)	Fire or Explosion		Aircraft Damage	Damage	II		Restricted Area During Operation	
		Warning N_2 Pressure in Fuel Tanks Must be Within $\pm$3 psi of ambient or bladder failure is imminent							Meteorological Data & Forecast Pulser Silence	
Personnel Familiarization & "*Inspection*" of A/C Session (External & Interior)	Personnel Un-*familiar with A/C*	Ignorance of "Do's" & *Don'ts*"	Accessing *or stepping* on A/C where not permitted	(Same as *Column 3*)	Personnel *Injury*	Injury	II	F-16 support *equip* awareness by Test Personnel	Tech Manuals *or generate* special procedures	Session conduc-*ted by TAC* personnel
					Aircraft Damage	Damage				
SUBSYSTEM OR FUNCTION: A/C Test Preps										
4b Test Points Identification & Marking	Black Boxes, Cables, Connections, Equipment Tracks or Bays, Crypto Gear Sensitivity, Mission Equip. vs. Flt Equip.	"Breaking" Connections Careless Handling	Improper re-connections	(Same as Column 3)	Equipment Damage or Temporary Loss	Damage	II		Test Plan Test Procedures Priorities Test Configs. Log Maint.	

TABLE 6

TESTING (SRF) (BACKUP FACILITY)

MODE	HAZARDOUS ELEMENT	EVENT CAUSING HAZARDOUS CONDITIONS	HAZARDOUS CONDITION	EVENT CAUSING POTENTIAL ACCIDENT	POTENTIAL ACCIDENT	EFFECT	HAZARD CLASS.	ACCIDENT PREVENTION MEASURES		
								HARDWARE	PROCEDURES	PERSONNEL
5e Test Ops. (VPD/SRF)	General: Similar to HPD Safety Requirements	Raising and Lowering of SRF Pulser								

TABLE 7

AIRCRAFT TEST PREPS

MODE	HAZARDOUS ELEMENT	EVENT CAUSING HAZARDOUS CONDITIONS	HAZARDOUS CONDITION	EVENT CAUSING POTENTIAL ACCIDENT	POTENTIAL ACCIDENT	EFFECT	HAZARD CLASS	ACCIDENT PREVENTION MEASURES		
								HARDWARE	PROCEDURES	PERSONNEL
1c Instrumentation Installations & Checkout	Sensors, cabling, (routing)	Multi-installations		(Same as Column 3)	Personnel Injury	Injury		Test Hardware Availability	Test Plan Test Procedures	Experienced Test Personnel
	Remote Atten. Microwave Transmitters		Excessive Heights		Equipment Damage	Damage	III	Onboard Lighting	Setups Priorities	
A/C Functional Power-On Checks (Power Cart)	Unused Cables Stowed/Secured			(Same as Column 3)	Personnel Injury	Injury	II	Flash-Lights Work-Stands	Instrum. Cables A-7E Cables;	
	DWG & Pneumatic Lines Others - Shielding & Grounding		Electrical Power Distributed Inside A/C		Equipment Damage	Damage	III	Access Platforms High Ranger Forklift with Pallet	Cables placed & Taped-Down Sensor Stability	
SUBSYSTEM OR FUNCTION: Testing (HPD										
5a Test Operations (Pulser Operating)	EMP Radiation	Pulser Firing	Personnel Exposure	(Same as Column 3)	Personnel Injury	Injury	II	Warning Lites	Safety Procedures &	
		Personnel In Work Volume Inadvertent Pulser Firing	Equipment Exposed & Not Ready For Exposure		Equipment Damage	Damage	III	Warning Siren Radio & PA Closed Circuit TV	O&M Contractor Coordination Test Personnel Total Interfacing	
	High Voltage High Current	Personnel Contact with A/C or Equip.	(Electric Shock)	(Same as Column 3)	Personnel Injury/ Death	Injury/ Death	II or I			
Pulser System Maintenance	High Voltage (charging)	Pulser Syst not Safe or Personnel Access not controlled	Personnel Contact (Electric Shock)	Same as Column 3)	Personnel Injury	Injury	II	Radio & PA Radio & PA Radio & PA	Req'd Personnel Coordination Safety Criteria/ Procedures	
Aircraft EMP Exposure	Suffocating Gasses	Engine Fire Extinguisher Squibs Initiated by EMP	Suffocation	(Same as Column 3)	Exposure to Fire Extinguisher Agent	Injury/ Death	II or I	Squibs Tested in Direct Drive Laboratory	Stay clear of Gas Cloud until dissipated.	
Canopy Removal	Explosives	Canopy Ejection System	Detonation	(Same as Column 3)	Personnel Injury/ Death	Injury/ Death	I or II	Warning Lites	AF Tech Order	

TABLE 8

TESTING (HPD)

MODE	HAZARDOUS ELEMENT	EVENT CAUSING HAZARDOUS CONDITIONS	HAZARDOUS CONDITION	EVENT CAUSING POTENTIAL ACCIDENT	POTENTIAL ACCIDENT	EFFECT	HAZARD CLAS.	ACCIDENT PREVENTION MEASURES: HARDWARE	ACCIDENT PREVENTION MEASURES: PROCEDURES	ACCIDENT PREVENTION MEASURES: PERSONNEL
5b Test Operations (Pulser Operating)	High Voltage High Current	Pulser Firing & Charging	Personnel near HPD Ant Terminations or Pulser C & I Van	(Same as Column 3)	Personnel Death	Death	I	Warning Lites & Siren Commo (PA)	Safety Procedures	Surveillance of working Vol by Test Personnel
Fuel Truck for Site's Generators (DASET, Antenna Lowering & Raising)	Loading Fuel	Inadvertent Pulser Firing	Fire and Explosion	(Same as Column 3)	Personnel Injury/ Death	Injury/ Death	II or I	Fire extinguishers available.	Safety Procedures	Qualified Personnel
Base Munitions Transportation	EMP Radiation	Pulser Firing (Base Explosion) (Munitions)	Base "Hold" Ignored	(Same as Column 3)	Personnel Injury	Injury	II			
SUBSYSTEM OR FUNCTION: Testing (HPD)										
5c Test Operations	HPD Pulser/ Antenna System	Lowering & Raising of System	Personnel near or under system A/C not clear	(Same as Column 3)	Personnel Injury/ Death Aircraft Damage	Injury or Death Damage	II or I II	Support cables safety checked.	Safety Procedures	
Test Operations	A/C Tools & Equip Used (in high places)	Changing Sensors & Instrum. Tools & Equip in high places	Excessive heights Falling ojbects	(Same as Column 3)	Personnel Injury/ Death	Injury or Death	II or I	Workstands Restraints Hard Hats Safety Shoes	Safety Proc. & Criteria Safety Criteria	
SUBSYSTEM OR FUNCTION: Testing (HPD)										
5d Test Contractor (Test Ops)	Lack of Accident Response	Slow Response	Untimely Manner of Response	(Same as Column 3)	Personnel Death	Death	I	First Aid Station on Site	Safety Help Provisions (Hospital Accommodation & Safety Procedures Pre-Coordinated.)	
Test Operations	Hydraulic Lines	Forklift Loose Channels	Swinging Lines Hydrofluid on Personn Personnel	(Same as Column 3)	Personnel Injury	Injury	II	Clearly Marked	Safety Procedures	Surveillance of Working Vol. by Test Personnel

SECTION 6
SAFETY PROGRAM

This section of the document presents the recommended program for achieving a safe test effort during the A-7E test program. The following paragraphs address the concepts of appointing a Safety Officer, the use of safety procedures, area signs, controlled access to the test area, safety equipment, personnel training, and other associated safety considerations.

6-1 SAFETY ORGANIZATION

Fundamental to a responsive and responsible safety program is implementation of the concept that anyone who detects an unsafe condition, no matter how seemingly trivial, has the responsibility to alert the rest of the test team and immediately stop all test operations. Ultimate responsibility for implementation of all safety measures resides in the Test Director, the FCDNA Test Director for the System-level test and the NSWC Test Director for the SCIT effort in the NWEF hangar. Authority for implementation of safety procedures to include restart of test operations after an unsafe condition has been detected has been functionally divided into aircraft operations and test technical operations. For the SCIT test this authority is vested in the NWEF Safety Officer for the former and the chief EG&G technician for the latter. For the System-level test, aircraft operations safety is within the authority of the Vought Project Coordinator and test technical operations safety within the authority of the AFWL Test Operations Director as shown in Figure 30.

6-2 SAFETY PROCEDURES

Procedures to assure safe operations for the A-7E assessment program fall into two categories:

1. Normal site safety procedures, and
2. procedures unique to the test operations.

The normal site safety procedures are delineated. These procedures will continue in force during this test program. Rather

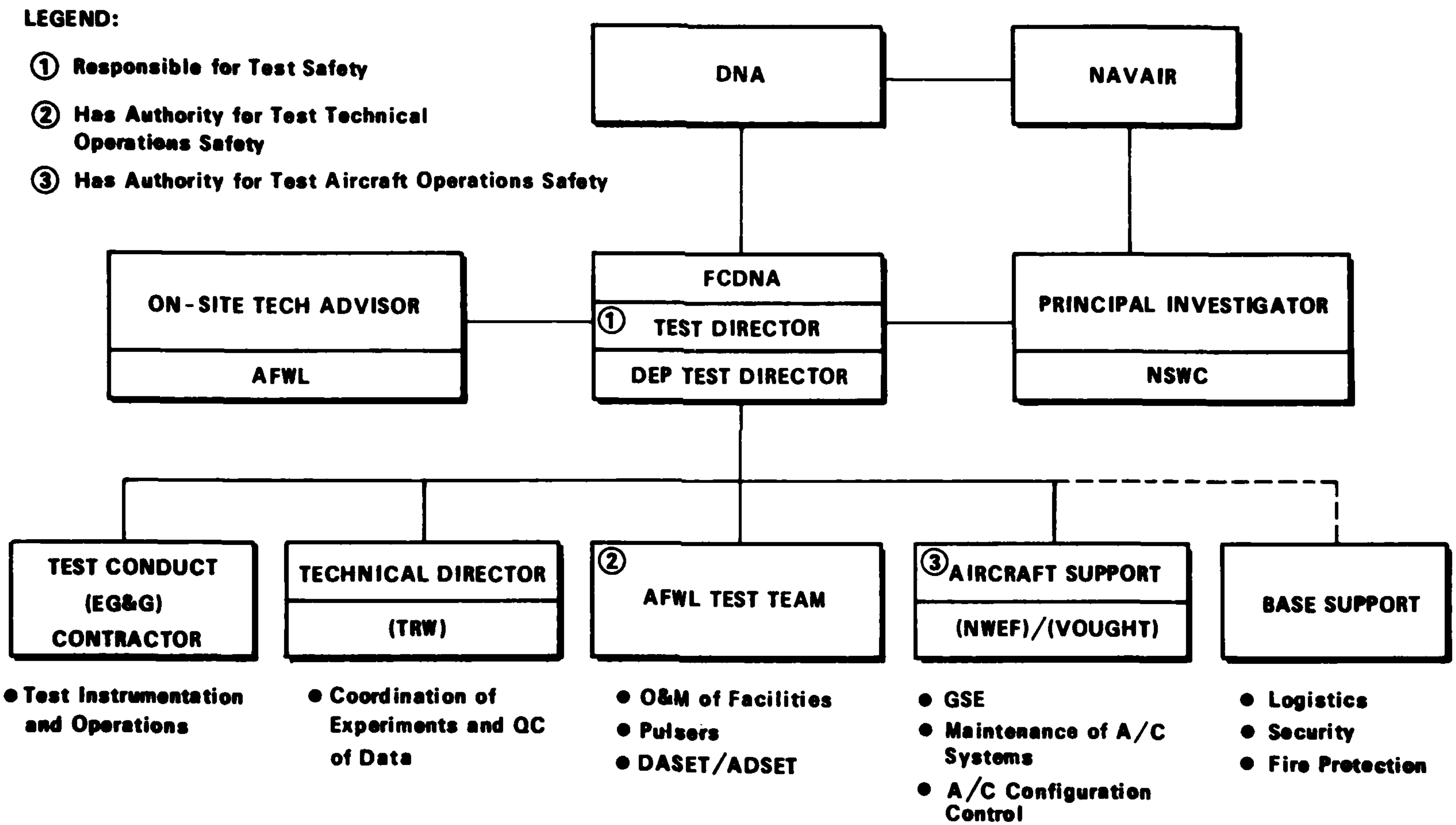


Figure 30. A-7E Test Conduct Organization

than reiterate these procedures in this document, they are incorporated herein by reference. Pertinent considerations for incorporation into the procedures by the site operations and/or test contractor are listed below:

(a) Use of physical barriers such as safety ropes, fences, etc., to limit personnel access into hazardous areas.
(b) Establishing a precise limit on the number of personnel allowed into the hazardous area.
(c) Establishment of precise locations for personnel required in the hazardous area.

Procedures will also be in effect for:

(a) Controlling general personnel access to the facility from a safety standpoint.
(b) Controlling personnel access to the site and in the site working volume during the pulser firing operations.
(c) Safety equipment required for each phase of the operation will be made available and proper instructions will be issued to all test personnel.
(d) Periodic checkout of safety equipment will be made.

6-3 AREA SIGNS

All hazardous areas require proper marking and identification so that personnel not familiar with the hazards in the area are made aware of the dangers. General guidelines for this type of activity are contained in both AFR 127-101 and OSHA. A detailed discussion, therefore, of area posting requirements will not be repeated in these recommendations.

6-4 ACCESS TO AREA

As a by-product of the security requirements of the test sites, personnel access is limited to those people who have a definite need to be in the area. This will aid the safety considerations by limiting the number of people in the working areas.

During times of hazardous operations, the Test Operations Director or his delegate will have complete control over the operations on the site and of access to the working areas. This officer will be able to suspend or terminate any test activity at his sole discretion if, in his judgement, safety is being compromised.

Any visitors wishing to go within the controlled test area must clear with the Test Director (or his delegate) prior to entering.

6-5 SAFETY EQUIPMENT

The Safety equipment which is necessary on the site is divided into three classes:

(a) First-aid equipment.
(b) Personal safety gear.
(c) Special safety equipment.

Adequate first-aid equipment currently is in existence at the sites, and site personnel are trained in first-aid techniques.

Individuals performing hazardous operations, such as working on and round the test stands, will be required to use proper safety equipment designed to minimize hazards. In this category are hard hats, safety shoes (with non-skid soles), and safety glasses or goggles where applicable. Contractors and Air Force organizations which have personnel operating on the site will provide safety equipment for their personnel.

6-6 PERSONNEL SAFETY BRIEFING

Safety procedures are effective only if they are adhered to. It is mandatory that all personnel involved in day-to-day operations on the test site be briefed in two areas:

(a) Performing their daily tasks, in a safe manner.
(b) Responding to an accident in a proper manner.

Personnel working at the test site will be trained in all elements of safe site operations. Items to be stressed are:

(a) Strict compliance to the safety directions.

(b) Careful adherence to safety procedures for hazardous operations.

(c) Obeying all warning signs in the work area.

(d) Continually examining the test site and test operations for potentially dangerous activities and conditions.

It is to be stressed that being "safety conscious" is each individual's responsibility at all times, not just the responsibility of the Safety Officers.

In addition, selected site and contractor personnel have been trained in areas of first-aid, safety inspections, and the proper utilization of special safety equipment. The number of people trained in this area is not large, but it is necessary that at all times at least one person who is well qualified in the area of first-aid be physically present at the test site.

6-7 STANDARD OPERATIONS

Standard operations procedures that have been established will be utilized at the test sites, especially in the following areas: operations and maintenance, protective equipment, housekeeping, lighting, and general safety practices. Under general safety practices are restrictions concerning clothing, watches and rings, intoxicants, tampering with equipment, personal conduct, electrical repairs, railings and toe boards, and the use and storage of hazardous material and equipment.

6-8 SUMMARY

This section has presented the recommended safety program for the A-7E test. The program primarily consists of four major elements:

(a) The designation of a Safety Team with complete safety authority on the test site.

(b) The establishment and implementation of safety procedures for normal site operations, and hazardous test preparation and testing operations.

(c) The acquisition and proper utilization of required safety equipment including first-aid equipment, personal safety equipment, and such special safety equipment as may be required to minimize potential accidents.

(d) Personnel briefings stressing day-to-day safety practices, and specialized training for designated personnel in the areas of first-aid.

Again, it is to be emphasized that the achievement of a safe test program does not result from a "one-shot" safety analysis. Rather, it is the result of continuing iterations between the various elements of the program, as the program progresses, and an examination of each of these elements in light of safety requirements. The test personnel associated with the program will review and, if necessary, revise the safety approach defined in this document as the changing and better defined constraints of this program dictate, including feedback from future operations.

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1. AFWL Regulation 127-1 "Safety", Air Force Weapons Laboratory, January 1973.

2. BDM Document DBM/A-128-75-TR, "HPD Facility Safety Analysis and Hazards Evaluation Report", 24 September 1975.

3. Air Force Regulation 127-101, "Industrial Safety Accident Prevention Handbook", 26 June 1970.

4. OSHA, "Occupational Safety and Health Standards", Federal Register, Volume 37, Number 202, Part II, 18 October 1972.

5. Air Force Regulation 127-12, "Air Force Occupational Safety and Health Program", 4 June 1976.

6. VPD II System Safety Plan (DRAFT), F29601-76-C-0049, March 1976.

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